

Dr. Pratik Shah & Dr. Neeraj Sharma's Note for

UROLOGY



Urology Ward Clinic

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PREFACE

KNOWLEDGE SHARED IS THE KNOWLEDGE GAINED

The idea of writing these notes for urology practical exams occurred to me when I was preparing for my practical exams. I constantly felt the need of a book that should be dedicated to prepare the student for urological practical examinations. Lot of material is available for various topics but all of them required some or the other form of modifications. As medical field is ever changing so some of the fact in those material was out of date. Very less material is available on topics of more common conditions and routinely faced by us in day to day practice like stone and prostate.

Although the efforts by USI-BOE are phenomenally great and unmatched in importance but most of us usually forget the questions asked and topic discussed as soon as the class is over.

These notes are just a compilation of those questions asked and subject topic discussed in various USI-BOE mock exams, CMEs and various practical case discussion classes conducted at various places during the period 2015-18.

These notes do not claim originality of questions or answers, these are merely a compilation of various questions asked, their answers searched and then arranged topic wise.

I heartily thank all my teachers who selflessly taught urology as a subject and are still teaching and guiding me. This book is adream of my teachers and a mark of respect towards their teaching.

I thank all my colleagues who shared their knowledge, question banks, Presentations and notes.

I thank Dr. Neeraj Sharma for laid down the foundation of this book and Dr. Pankaj Dholaria for constant guidance and unconditional support to my work.

This will not be possible without blessings of the Lord Mahavirswami and my Guru Shri Narratna Suriiji.

I heartily thank my family (specially my little daughter) for shelling out their part of time with me in writing these notes.

As my teachers have never charged a single penny for sharing their knowledge, these notes are provided to you *FREE OF COST*. This book is only for internal circulation of the students only and not intended for any profit.

I will consider the project a real success if you guys find it useful for your exams. I request all of you to add as many as question answers in each topic of these notes and pass it on to your successive urology generations.

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FORWARD

Passing on the torch of urology learning to next generation

I heartly thank all my fellow colleagues and readers who made the book “Notes for urology practicals, by Neeraj sharma” a decent success. The book reached all the urology student circles and was acclaimed, praised and used by urology students for practical examination preparations world wide.

The urology treatment guidelines and concepts keep on changing with new facts and studies coming up. Hence it is always necessary to keep updating the book moreover there were many chapters and topics were missing in the previous edition. But in a daily cycle of learning – earning somehow there were time constraints that book could not be updated for long.

I hereby thank my colleague Dr. Pratik Shah who has single handedly taken the pain and devoted his time to fill all the lacunas in the previous book. It is very difficult to find people like Dr. Pratik, who came forward on their own and devoted their time and hard work for the betterment of future generations.

I hereby congratulate Dr. Pratik for completing this project and wish him immense success and luck.

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FOREWORD

॥ न चोर हार्य न य राजकारी ॥
॥ न भातु भोज्यम्, न च मारकारी ॥
॥ व्यय कृते वंदनम् विद्या घनं सर्व घनम् प्रथनम् ॥

The Wealth that can't be stolen neither can be abducted by state nor can be divided amongst brothers neither is burdensome.

The wealth that increases by spending is education. And is supreme off all possessions

It is indeed a great moment of pleasure and opportunity to write forward off the book “Urology Ward Clinic” by Dr. Pratik shah Whom I have seen being metamorphosed from a surgeon to a resident and now a consultant urologist.

I take opportunity to congratulate him for his knowledge and wisdom which is which is been shared for the betterment of urology fraternity .

Advances of new technologies and procedures compels the practicing Doctor to dispense same with practicing and learning the leaves off same society this book highlights the practical tips in the urology ward and rounds which was initiated by Dr. Neeraj Sharma.

Personally I consider Dr. Pratik Shah is the fittest Individual to compile all the tips gained during his tenure of residency and make this book.

Appreciating the time and pain inflicted on himself by Dr. Pratik Shah for writing this book I wish him a success in all his future endeavors. Surely this book is going to help the urology residents By leaps and bounds.

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FOREWORD

I am very happy to write foreword to the book “Urology Ward Clinic”.

There is a paradigm shift in the practice of medicine these days, especially in the branch of urology, which has undergone major evolutionary changes in the last few decades. Our teachers used to rely more on the clinical signs while the present generation of urologists are dependent more on the investigations, but even in this era, the importance of clinical knowledge and bedside teaching cannot be overemphasized. As we all know, India is a country with plenty of resources, I believe we all can lead our field in terms of clinical knowledge. Though there is plethora of books and material available for any topic in urology, there is a scarcity of printed work on clinical skills.

With this work, Dr. Pratik Shah has been able to combine the knowledge of many senior urologists who guided him during his post graduation days and thereafter.

I am sure, his book will be useful to post graduate students of urology for their exam preparation and will fill the void of clinical knowledge of practicing urologist as well.

I hereby congratulate Dr. Pratik Shah and wish him great success in his future endeavors in urology

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FOREWORD

“Everything must be made as simple as possible, but not simpler”
- Albert Einstein

As a urology resident myself, quite a few years ago – I hated to remember causes by numbers or treatment protocols or steps in sequence or mnemonics. It was a mammoth task to read revise and remember the Campbell – the bible of urology.

Following the advice of Einstein, fortunately for present day urology residents, Dr. Neeraj Sharma brought out “Notes on Urology Practicals” and was a great help to urology residents. However, recent explosion in urology literature, newer guidelines and improvised protocols required upgradation.

I am happy that Dr. Pratik Shah has painstakingly worked on it and updated it.

Dr. Pratik Shah was outstanding as urology resident and made us proud by his performance in examinations and by winning many quiz at national and international levels. His compilation of questions asked in examination will guide urology residents in their preparation. It cannot replace years of hard work, but certainly it will work as ready reckoner at the time of examination and even during ward rounds and urological practice.

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CHAPTER

1

Stone Disease

ETIOPATHOLOGY AND INVESTIGATIONS:

❖ Classification of Stone Disease:

1. Non Infective Stones



- Calcium Oxalates
- Calcium Phosphates
- Uric Acid

2. Infective Stones



- Magnesium Ammonium Phosphate
- Carbonate Apatite
- Ammonium Urate

3. Genetic Cause

- Cystine
- Xanthine
- 2, 8 Dihydroxyadenine

4. Drug Induced

- Promotion of Crystallization
- Altering Urinary Environment

❖ Classification of stone by composition:

- | | |
|--------------------------------|--------------|
| • Calcium Oxalate Monohydrate | - Whewellite |
| • Calcium Oxalate Dihydrate | - Whedellite |
| • Calcium Phosphate | - Apatite |
| • Calcium Hydrogen Phosphate | - Brushite |
| • Magnesium Ammonium Phosphate | - Struvite |
| • Uric Acid | |
| • Cystine | |
| • 2-8 Dihydroxyadenine | |
| • Matrix | |
| • Drug Composition | |

❖ Metabolic Active Stone

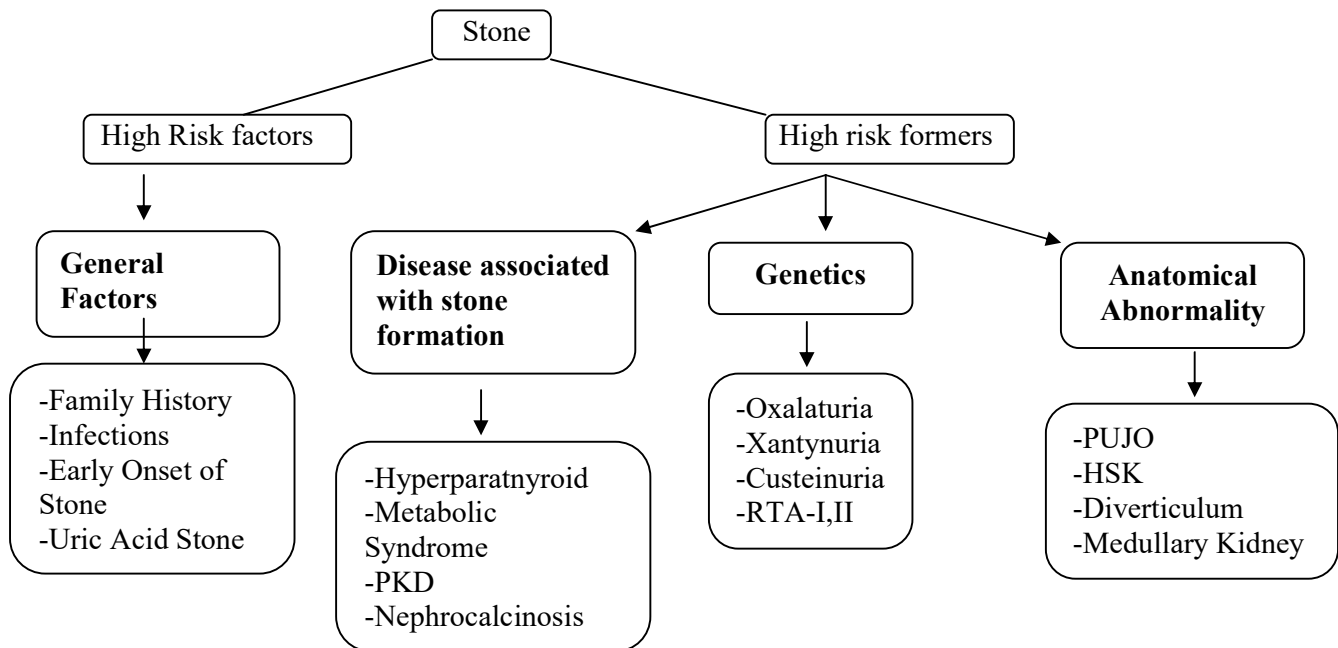
Within 1 year of stone management if:
Formation of new stone on imaging
Passage of documented gravel



❖ **Surgically Active Stone:**

Stone which requires intervention due to infection, colic or obstruction.

❖ **High Risk Stone Formers**



❖ **Solubility Product: K_{sp}**

Concentration at which saturation is reached and addition of further products leads to crystallization unless condition of solution is changed

❖ **Formation Product: K_f**

Point at which saturation is reached and further salt can't be held in solution.

❖ **Under saturated Solution: $< K_{sp}$**

No crystal formation

❖ **Metastatic Solution: Between K_{sp} – K_f**

- No spontaneous crystallization
- Already formed crystals may grow
- Heterogeneous nucleation may occur

❖ **Unstable: $> K_f$**

- Denovo crystallization
- Nucleation occurs
- Crystal growth

❖ **Nucleus:**

Enlarged crystal formation that doesn't dissolve may be
Heterogeneous → of various particles
Homogeneous → Same particles



❖ **Crystal Retention:**

Free Particle } Theory
Fixed Particle }

❖ **X-Ray in Stone Management:**

- Baseline work-up.
- To identify radio-opaque / lucent stone for further follow-up.

❖ **Radiolucent Stone on X-Ray:**

- Uric Acid
- Xanthin
- Matrix Stone
- Drug Stone
- 2, 8 Dihydroxyadanine

❖ **Dense Radio-opaque Stones:**

- Calcium Oxalate Monohydrate
- Calcium Oxalate Dihydrate
- Calcium Phosphates

❖ For CT Scan to detect as stone **HU > 100**

Indinavir (Drug) stone

Matrix stone can be radiolucent for CT too.

❖ Minimum size of stone detected on X-Ray:

Calcium containing stone: 2-3mm

Cystain stone: 3-4mm

❖ **Sensitivity Xray KUB: 45-75, Specificity: 80-85%**

❖ **USG:** Primary modality to diagnosis:

Advantages:

- Safe
- No Radiation
- Easily available, even urologist can trained to do so.
- Number and location can be determined.
- Kidney architecture and parenchymal thickness can be known.
- Dilatation (hydronephrosis, hydroureteronephrosis) can be known.
-

D. Advantages:

- Subjective
- Lower ureter sometimes differ to traced
- Size under estimation

Sensitivity: 45%, Specificity: 94% for ureteric stone

Sensitivity: 45%, Specificity: 88% for Renal stone

❖ Patient with acute colic:

Investigation of colic

- Plain CT Scan KUB



It can detect

- Uric Acid
- Xantain Stone

But not -

- Matrix stone
- Indinvair stone

❖ **Low Dose CT Scan:**

85% sensitivity for stone < 3mm

100% sensitivity for stone > 3mm

- ❖ *Intravenous contrast study must be required for management (intervention) of stone. For PCNL and RIRS contrast CT Scan (CT IVP) is must if S. Creatinine permits. Before ESWL also CT Urography needed. For Mid Ureteric, Lower Ureteric stone planning for URS: Plain CT KUB can suffice, provided good parenchymal thickness.*

Do functional study before intervention:

- *For medico-legal purpose*
- *Before anatomy definition*

(Discussed by Dr. R.B. Sabnis, Dr. Kekre and Dr. Anis Shreevastava in Mock exam-2018 in Pondicherry)

❖ **CT Urography Or IVP?**

CT Urography: Favoring Points:

1. No bowl preparation
2. Parenchymal lesion can be detected
3. Number of stone identify
4. Skin to stone distance
5. Bulk assessment of stone 3D reconstruction
6. Retro Renal colon identification
7. Perinephric collection can detected

D. Advantages:

- High radiation exposure
- Costly

❖ **Baseline Investigations:**

1. Urine Microscopy
2. Urine Culture
3. Complete Blood Count (CBC)
4. S. Creatinine
5. S. Calcium
6. Uric Acid
7. PT INR for PCNL

❖ **What is Naidr S. Cratinine?**

Nadir S. Creatinine is the persistence lowest possible value achieved.

In patient with obstructive uropathy –

Do S. Creatinine daily for initial 2-3 days to know trend of decreasing and do at 15th day of stability value.

At least two values of near same reading.

In obstructive uropathy patient if S. Creatinine doesn't achieved Nadir value look for USG to identify any undefined calyx of HUN (Dr. R.B. Sabnis)

❖ **Stone Analysis:**

- For any patient who has first time stone former

Indication of repeat stone analysis in:

1. **Recurrence under pharmacological prevention.**
2. **Early recurrence after therapeutic intervention.**
3. **Vary late recurrent after stone management.**

❖ **Stone Protocol CT Scan:**

From upper pole of kidney to base of bladder
Thinner slices of 5mm

❖ **DECT (Dual Energy CT Scan):**

Simultaneously scanning using two different energy which permits tissue characteristics
DECT allows differentiation of tissue / stone composition on principle of – variation in attenuation characteristics of stone at different X-Ray based on their composition.

❖ **What is absorbed dose?**

Energy absorbed from radiation exposure
Measures in Gray

Effective Dose:

Different tissue has different interaction to radiation. Application of conversion factor to absorbed dose gives ED.
Measured in Sivert.

Absorbed dose used in context of therapeutic relation. While effective dose used in context of exposure to technician and surgeon.

PCNL approximately radiation dose: 43 mGy

URSL approximately radiation dose: 27 mGy

ED of stone protocol CT Scan: 3 ± 0.5 msv

X-Ray KUB: 0.63 msv

IVP: 1.3 – 3 msv

LD CT Scan: No specific definition, but < 3 msv.

❖ **STONE MORPHOMETRY**

1. **Rosswailer Classification:**

For Staghorn Stones -

- **Borderline:** Renal pelvis & one calyx
- **Partial Staghorn:** Pelvis & 2 calyx involved
- **Complete Staghorn:** Whole collecting system or 80% of PCS
- **Gigantic:** Complete PCS involved

2. **Stone Morphometric Classification:**

Depends upon Total stone burden and
percentage of unfavourable calyx stone location

- Fav calyx: Defined as calyx having obtuse angle and infundibulate width > 8 mm.

- Type I: $< 5000\text{mm}^3$ TSV + $< 5\%$ UFCP
- Type II: $5000\text{mm}^3 - 20000\text{mm}^3$ TSV + $< 5\%$ UFCP
- Type II-b: $5000\text{mm}^3 - 20000\text{mm}^3$ TSV + $> 5\%$ UFCP
- Type III: $> 20000\text{mm}^3$ and any unfav calyx

3. Guy Stone scoring for complexity:

- Type I: Solitary stone mid / lower calyx or in pelvis with normal anatomy
- Type II: Solitary stone in upper calyx
Multiple stone in mid calyx, lower calyx
Solitary stone in abnormal anatomy
- Type III: Partial Staghorn
Diverticular Stone
Multiple stone in abnormal anatomy
- Type IV: Complex Staghorn
Stone in spina bifida

Fallacies:

- No consideration for stone size, density and composition
- Same group for abnormal spine patient and shaghorn stone patient

4. Stone Score:

S.T.O.N.E.

- Size 1 Point: $0-399\text{ mm}^2$
- Size 2 Point: $400-800\text{ mm}^2$
- Size 3 Point: $800-1600\text{ mm}^2$
- Size 4 Point: $>1600\text{ mm}^2$

Tract Length: $< 10\text{cm} - 1$
 $> 10\text{cm} - 2$

Obstruction: Yes: 2
No: 1

Number of calyx: 1 – 1
2 – 2-3 calyx
3 – Staghorn

Essence: HU 1 - $< 950\text{ HU}$
2 - $> 950\text{ HU}$

5. CERPO:

C – Morphometric Stone Size
R – Recurrence
E – Extra / Intra Renal Pelvis +/- of dilatation
P – Pt of Kidney

❖ Bilateral Renal Stones Bilateral PCNL

Which side to do first is not important now a day with availability of endourology.

It was important in era of open surgery.

Complex side surgery leads to more complication so delaying simple side surgery

→ Hinman's Counter Balance Rule

So, simple stone surgery should be done first.

Still:

Obstructive → Symptomatic → Simple order should follow:

If both non obstructive → Symptomatic side first

If both non-obstructive non-symptomatic → Then simple first

Today bilateral simultaneous PCNL or PCNL in 3-4 days gap can be performed.

❖ **PCN (NEPHROSTOMY) FOR OBSTRUCTIVE UROPATHY STONE**

❖ **DJ Stent / PCN for diversion in obstructive uropathy?**

❖ **PCN:**

Advantages:

1. Under local anaesthesia
2. Better drainage
3. If it is clogged we can flush it
4. Follow up dye study can be done easily
5. Differential function can be determined

Disadvantages:

1. In SFK, PCN can damage nephrons
2. To maintain tube outside always difficult
3. Dislodgement of tube
4. Complications of PCN

DJ Stenting:

1. No outside tube, easy to manage
2. No nephron loss

Disadvantages:

1. Needs anaesthesia
2. Stent related symptoms
3. Difficult to obtain differentiated function

Studies are suggestive that, there is no superiority of DJ stent or PCN over each other. DJ Stent or PCN should be done depends upon the condition

❖ **When to do CT Scan
Prior to PCN or after PCN?**

Answer can be given either way. Both the ways you have to justify.

CT Scan prior to PCN, Why?

1. Objective documentation of stone
2. USG is subjective
3. Better idea of planning DJ Stent / PCN
4. Better anatomical delineation
5. Not much time consuming

Why CT Scan after putting PCN ?

1. To R/o small radiolucent stone
2. H/O and location of stone to determined
3. To access kidney

4. Best anatomical ideal of kidney

- ❖ During PCN if the system is high pressure - urine is coming with good flow it is good.
As initially all function kidney have high pressure obstruction. Chances of function recovery is good.
Over period of time obstruction open up pyelovenous and pylolymphatic shunting.
Leads to low pressure and chances recovery of function is poor.

❖ How to calculate renal function test from PCN ?

1. Urine output
2. High pressure system – Good function recovery
3. Creatinine clearance

$$\frac{\text{urinary Creatinine} \times \text{Volume}}{\text{plasma Creatinine} \times 24 \times 60}$$

4. Urine pH and specific gravity
Measures concentration ability of urine
Measures density of urine c/c to pure water
Measures by refractometer
Influence by: Urine molecules, molecular Wt & Size.
5. FE. of Na from PCN urine
6. DTPA Renal Scan
If PCN kept for infection, do after control of infection
If PCN kept for obstruction, do it when urine output is constant and S. Creatinine is stable.

❖ In SKF always prefer DJ stent over PCN as PCN can lead to some nephron damage

❖ PCNL in Chronic Kidney Disease (CKD)

❖ Problems of doing PCNL in CKD

1. CKD patient are anaemic
 2. Impaired platelet function – Increase tendency of bleeding
 3. More susceptible to infection
 4. Body homeostatic impaired due to abnormality in CKD and fluid overload
 5. Secondary hyperparathyroidism and osteodystrophy
 6. Cardiomyopathy
- So they are at high risk for anaesthesia and surgery

❖ Poor prognosis factors in CKD?

1. Stone burden > 1500 mm³
2. PT < 5mm
3. Young age
4. Recurrent UTI

❖ Study suggested that in 35% of CKD patient renal function test improves after surgery or stabilized

❖ Causes of improvement of eGFR:

1. Removal of stone
2. Decrease foci of infection

❖ Measures to decrease bleeding in CKD patient during PCNL?

1. Use balloon dilator
2. USG guided puncture
3. Staging of procedure
4. Reducing tract size
5. Prior nephrostomy tube



- ❖ Measures to **decrease infection in CKD** patient during PCNL?
 1. Urine culture & sensitivity according antibiotics
 2. Adequate pre-operative drainage
 3. Complete stone clearance
 4. Keep pelvic pressure low
 5. Putting nephrostomy tube
- ❖ **No antibiotics can eliminate infection in stone patient, but they can prevent progression to sepsis and bacteriuria.**
- ❖ In CKD patient always put nephrostomy tube
 1. For safety
 2. For drainage if needed
 3. They have platelet dysfunction
- ❖ Why to put nephrostomy tube post PCNL?
 - Good drainage
 - Temponade
 - Control of upper tract if re-entry is needed. It is easy from nephrostomy tube
- ❖ What is tubeless and total tubeless PCNL?

Tubeless PCNL: Without nephrostomy tube but with DJ stenting

Total Tubeless PCNL: No nephrostomy, No DJ stent.
But having RGC is considered as total tubeless PCNL
- ❖ **Criteria for Tubeless PCNL**
 1. **Stone < 3cm**
 2. **Single access tract**
 3. **No residual stone**
 4. **No perforation of PCS**
 5. **No bleeding**
 6. **No need for second look PCNL**
- ❖ Advantages of Tubeless PCNL?
 - Decrease pain
 - Decrease analgesic requirement
 - Decrease hospital stay
- ❖ Nephrostomy Tube:

First PCN was kept by: Goodwin

Fist Nephrostomy after PCNL by: Fernstrom
- ❖ Advantage of keeping nephrostomy: (Previously described)
- Disdvantages:
 1. Pain
 2. Difficult to maintain
 3. Decrease QOL post surgery
- ❖ **Various types of Nephrostomy Tubes:**
 1. **Foley / Council Catheter:**

Retention Michenism : Ballon, but even 5ml balloon can be too large for PCS.

If balloon can fixed at one infundibulum it can cause obstruction of calyx which remains undiverted.

Always inflate with Normal Saline or distilled water and not with contrast.

2. Melacoat Catheter:

Retention Michenism: Flanges at rest

Non obstructing atraumatic retention michenism

Variety: Re-entry melacoat catheter

Melacoat catheter with long extended tip into ureter for re-entry into PCS

3. Cope Catheter:

Retention Mich: String

String forms secure coil

Not easily dislodge from pelvis

4. Circle Nephrostomy:

Excellent drainage

Secure, easily exchangeable and little trauma.

Drainage and irrigation of pelvis can be done simultaniously.

5. Nephroureteric Stent:

A nephroureteral stent has renal coil like that of cope nephrostomy tube but having extra extension into ureter.

Ureteric portion is of same diameter or of narrow C/c to nephrostomy portion

❖ Various Positions for PCNL

1. Prone Position

Advantages

1. Wide surface for puncturing
2. Stable horizontal working surface
3. Direct access to posterior calyx
4. Most of urologist are trained for it during training

Disadvantages

1. Difficult in obese patient and spinal abnormality patient
2. Position must be changed
3. Cardiac index decrease in patient
4. If proper support not given R/S index also decrease
5. More neurological and facial injury
6. more fatigue to surgeon

2. Supine Modified: (Waldivia Urea)

Advantages

1. No change in position
2. Better for anaesthetic purpose
3. More convenient to obese and spinal abnormality patient
4. Decrease nerve injury
5. Horizontal access sheath → stone migration and easy retrieval

Disadvantages

1. Not trained for supine PCNL
2. More anterior calyx entry
3. Superior calyx entry difficult
4. Poor vision
5. Small window for puncturing
6. Awkward downward positioning for renal tract

3. Lateral:

Advantages

1. Advise of prone and supine position both
2. Convenient for obese & abnormal spine patient
3. Decrease airway compromise

Disadvantages

1. Bilateral PCNL impossible in same sitting
2. More learning curve
3. Stone migrating more to ureter

❖ Variations in PCNL

1. **Standard PCNL:**

- Many variation in definition
- Previously any tract **dilatation > 26 FR.** considered as standard PCNL
- Now-a-day anything **≥ 20 FR.** dilatation is considered as standard PCNL

2. **Miniperk PCNL:** Miniperk means Mini PCNL

- First by Ballmen
- Anything **< 20 fr** dilatation known as miniperk PCNL
- Ideally **16 FR.** dilatation and using **13.5FR.** nephroscope

3. **Superperk:** (Dr. Kaushik Shah & Dr. M.S. Agrawal) (Superior version of PCNL)

- Using suction to remove all fragments
- Maintain low pressure system
- Using multihole RGC
- **10 FR.** or **12 FR.** dilatation using special shah sheath
- Shah Sheath: having cannula (10 fr. / 12 fr., 8-20cm) suction master and obturator
- Hence, **4.5 FR. / 6 fFR** pediatric URS as nephroscope
- Stone retrieval not depended on eddy current effect.

4. **UMP (Ultraminiperk PCNL):** Dr. Janak Desai

- Miniature of PCNL (Mini)
- Using **7.5 FR.** nephroscoe sheath and **3 FR.** nephroscope
- 7.5 FR. inner sheath and 11 FR. outer sheath
- 7.5 FR nephroscope has:
 - a) Irrigation
 - b) Telescope
 - c) Laser port
- Stones are removed with jet effect and eddy current effect.

5. **Microperk (Needle Perk) PCNL:** Dr. Mahesh R. Desai

- Using **4.8 FR.** all seeing needle
- Single step using **16** gauge needle
- After puncturing 3 way connected is applied to needle
 - a) Saline irrigation 100ml/min
 - b) 0.9mm flexible telescope
 - c) 365µm laser fiber

6. **Micromini PCNL:** Dr. R.B. Sabnis

- Since 16 G needle is delicate and it can be bent if manipulation done inside system
- To overcome this **8 FR.** metallic sheath with same 3 way adaptor
- With this 1.6mm ultrasonic lithoclast can be used.
- Micromini wear and tear of instrument is less.

7. **Chinese PCNL:** Supermini PCNL – Dr. Zeng

- Using **10-14 FR.** access sheath
- **7 FR.** endoscope and enhanced irrigation
- Two separate irrigation system
Main and Auxillary

❖ OPEN STONE SURGERIES

❖ Indication of open stone surgeries

1. Complex stone burden
2. Intra renal anatomical abnormality like PUJ Obstruction
3. Skeletal abnormality
4. Stone in ectopic kidney
5. Patient's preference
6. Concomitant other open surgery

❖ Pyelolithotomy:

- Removal of stone from pelvis
- Vertical incision: extra renal pelvis not crossing PUJ
- Transverse: In mid part of pelvis
- Less damaging to spinal fibers of pelvis
- Smiling or U shape

❖ Coagulum Pyelolithotomy:

- Pelvic calculi with multiple calyx stone. Cryoprecipitate, thrombin calcium are used to make coagulum of stones.

❖ Extended Pyelolithotomy:

- Dissect renal hilum
- Transverse pyelolithotomy so can extend into major calyx
- C/I:
 - Intra renal pelvis
 - Prior pyelolithotomy

❖ Radial Nephrotomy:

- Posterior Segment: Along line of avascular plane of Brodel's
- Anterior Segment: Radial and parallel to renal artery branch

❖ Anatomic Nephrolithotomy:

- Anatomic Nephrolithotomy done first by **Dr. Boyce**
- Anatomic means no atrophy
- In Anatomic Nephrolithotomy kidney is bivalved and stone is removed.
- Indicated for:
 1. Complex complete staghorn
 2. Complex intra renal pelvis
- **Modified Anatomic Nephrolithotomy:**
 1. No need to dissect posterior segment artery
 2. No need to put pre-operative DJ stent
 3. No water tight closure of system
 4. No use of methylene blue in artery
 5. Usage of ice slice for surgical cooling

❖ What to do if stone not coming from pyelolithotomy incision?

1. Use energy and break stone
2. Bone cutter cut the stone

1. Palpation
2. Saline flush
3. Use intra operative flexible scope
4. Choledocoscope (Rare)
5. Portable on table X-Ray.

- ❖ Advantage of smiling or U shape incision:
1. Intra renal extension can done
 2. Repair easy
 3. Vascularity maintained

❖ ENERGY SOURCES FOR STONE FRAGMENTATION

1. **Electrohydraulic Energy:**

Not used now

Mechanism: Two spark electrodes at tip of probe. When they are charged they produce spark. This spark can convert liquid into plasma. Plasma is formed 360° outward from charged wave and high pressure jet. For stone fragmentation probe must be 1mm away from stone

Advantages:

1. Less costly
2. Flexibility of probe

Disadvantages:

1. High ureteric damage
2. Retropulsion of stone
3. More time for smooth surface stone
4. More time for large stone
5. More chances of perforation for hard and impacted stone

2. **Pneumatic Energy:**

Mechanism: Ballistic energy forces that transfer kinetic energy from probe to stone

It uses:

1. Compressed Gas (CO₂ cartridges) Maximum 12 Hz
- OR
2. Electrical Coil → 15-30 Hz

It produces jack hammer effect

Projectile metal in hand piece propels by compressed air against metal probe and brought back into position by rubber bush.

Advantages:

1. Versatile
2. Cheap
3. Easy to use
4. Low maintenance
5. More durable

Disadvantages:

1. Not for flexible scope
2. Stone migration more
3. Not effective for soft stone as energy dissipated
4. If probe bends then energy dissipated
5. High chances of residual fragment stone

Probes:

2.5mm for PCNL
0.8,, 4 fr. URS
1 for 6/75 fr. URS

Length: 42-62cm
Length: 42cm for PCNL
Length: 62cm for URSL

3. Ultrasonic Energy:

Michenism: Produce sound wave of 23000 Hz to 27000 Hz by passing electrical current through pizeoelectrical crystals and produced micro vibration energy to stone
Metal probe vibrates when comes into contact with stone leads to small fragments of stone.

Advantages:

1. Best combination of stone fragmentation and removal
2. <2mm size fragments
3. Minimal injury to tissue

Disadvantages:

1. Costly
2. Large diameter rigid probe

4. Dual Energy:

Combined pneumatic and ultrasonic energy
Pneumatic probe: fragments stone into larger fragments
Ultrasonic probe: fragments into smaller pieces and aspiration

1. Swiss Lithoclast:
 - Outer probe ultrasonic
 - Inner one pneumatic
2. Cyber Wan:
 - Opposite to swiss lithoclast

5. Laser:

1. ER: Yag
2. HO: Yag

Michenism:

1. Photothermal: Glowing hot stone
Direct light energy absorption by stone which increase rapid increase of stone temperature.
2. Photo Acoustic:
Rapid vaporization of fluid between stone and probe produce vapour channel.
More direct energy to transfer.
Torpedo shaped bubble more damaging.

Advantages:

1. More safe, less tissue damage
2. Stone dusting
3. Used for flexible scope
4. Less retropulsion of stone

Disadvantages:

1. More costly

2. Theoretical produce cynide when comes into contrast with uric acid stone
3. Not scan practically

❖ **Freddy:** Frequency double dual pulse aYAG.
Nd: YAG with 512 & 1024 frequency

❖ **PCNL in morbid obesity patient**

1. More problem with anaesthesia
2. Difficulty in positioning
 - a) Prone position more difficult
 - b) Difficult to put bolster
3. Length of amplatz and scope
 - a) As more skin to kidney distance
 - b) Use large 22cm size amplatz

If not available then:

- a) Incise skin upto subcuticular level and then puncture dilation
- b) Put nephrostomy for 1 week and kept tract mature
- c) Flexible nephroscope can be used

4. High chances of dislodgement of nephrostomy

❖ **Management of calyx diverticulum stone:**

Urothelium lined non secretory cystic dilation of collecting system having narrow connection to PCS allow for filling and draining.

Causes for stone in diverticulum: urine stasis and metabolic abnormality

Classification: **DRATLER**

- | | |
|--------------|------------------------|
| a) Type I: | Open mouth short neck |
| b) Type II: | Close mouth short neck |
| c) Type III: | Close mouth long neck |
| d) Type IV: | Obliterated neck |

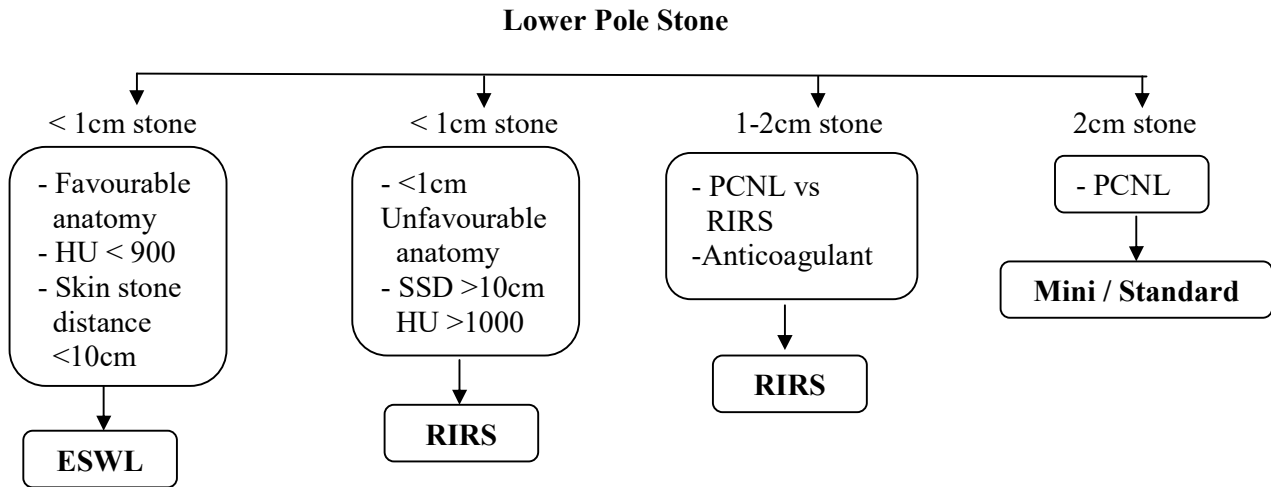
Most of stone are asymptomatic

Management option:

1. URS: can be option for upper, middle calyx diverticulum with <2cm stone
2. PCNL: First choice
 - a) Always do direct stone puncture
 - b) Try to fulgurate calyx diverticular lining
 - c) Dilatation of neck if possible

- | | | |
|--------------|------|---------------|
| 1. Type I: | ESWL | } Best option |
| 2. Type II: | URS | |
| 3. Type III: | PCNL | |





❖ **Stone in abnormal spine:**

Problem of positioning:

- Anesthesia
- Puncture access

Pre-operative evaluation: PFT, 2D echocardiography

Position: Prone v/s supine controversy

Puncture: Anatomic relation distanced, USG guided is best

ESWL: Not good option

1. Difficult positioning
2. Targeting of stone is difficult
3. Passage of fragments can be hampered
4. High re-treatment rate

URS: Rigid URS is difficult to negotiated

❖ **PCNL for salvage ESWL: difficult**

As:

1. Stone fragments are scattered after ESWL
2. Stone fragments are lying sub-urothelially within parenchyma
3. More intra operative timing.

❖ **STONE IN HORSE SHOE KIDNEY**

Incident: 15-20% of horse shoe kidney

Why more risk?

1. Anteriorly placed elongated pelvis
2. High insetion of pelvis
3. Proximal ureter courses anterior and on isthemus
4. Some form of delay normal impaired drainage

1. ESWL: For < 1.5cm pelvic or upper calyx stone can be considered.
 - a) PUJO must R/o
 - b) Anterior and medially rotated kidney position then normal
 - c) Localization of stone difficult
 - d) Positioning may problem



- e) High skin to stone distance – stone may not fall onto f2. It may fall onto elongated f2 pathway. “blast pathway”
 - f) High retreatment rate
 - g) High number of shock / session.
2. URS: difficult in tortuous anterior ureter.
3. PCNL: best option
- Posterior calyx directly positioned posteriorly.
 - Long tract distance
 - Best approach with posterior superior calyx and from here all calyx can be visualised.
 - Large Amplatz is needed.
 - More intra operative time.
 - Possibility of retro renal colon.
 - Major arteries coming from ventromedial direction so safe upper calyx puncture.

❖ **STONE IN ECTOPIC KIDNEY**

Highly tailored approached

Always rule out PUJO.

ESWL: For pelvic kidney – prone position as bony pelvis may hindrance stone localization.
Localisation difficult
Poor stone passage

URS: Good option
Spine position – Best

PCNL: Difficult to puncturing
Can't do direct fluoro puncturing. USG guidance is must. Puncture must be laparoscopic assisted or USG/ CT guided.
Supine position

4. Laparoscopic / Open Stone Surgery:

❖ **STONE IN TRANSPLANTED KIDNEY**

❖ Incident: 0.5 – 3%

High Risk Why?

1. Immunosuppressant
 - Increase infection rate
 - Increase urinary tract infection
2. Papillary necrosis
3. Metabolic abnormality for which transplant done
4. Hyper filtration, RTA
5. Persistence hyperparathyroidism

Patient doesn't have typical colic.

As kidney and ureter are denervated

Presented as graft rejection

USG/ NCG KUB needed if unexplained fever or failure to thrive to R/O stone in transplanted kidney

❖ Difficulties:

1. Solitary kidney
2. Anatomical location
 - Obstacle by iliac position
3. Ureteric course
 - Anterior location of U.O.
 - Negotiation difficult
4. Coagulation status / Immunosuppressant

❖ Supine PCNL:

1. Easy anterior location
2. USG guided puncturing
3. Difficult dilatation: Fibrosis around transplanted kidney
4. Pelvis rotated medially so similar to post PCNL

ESWL

❖ C/I for ESWL:

1. Pregnancy
2. Uncontrolled coagulopathy
3. Untreated urinary tract infection
4. Distal obstruction
5. Aortic aneurysm
6. Skeletal abnormality

❖ Factors which makes ESWL ineffective:

1. Composition of stone (Brushite, Cystine, Matrix)
2. HU > 1000
3. Stone skin distance > 10cm
4. Abnormal calyx anatomy
 - Steep infundibulo pelvis
 - Narrow infundibulum
 - Long lower pole calyx
5. Abnormal skeletal anatomy

❖ Mechanism of ESWL:

1. Spall fracture
2. Compression force
3. Shear stress
4. Super focusing
5. Cavitation forces
6. Dynamic fracture

❖ Effects of ESWL:

Trauma to skeletal muscle liver.

- Vascular injury
- Perforation
- Rupture of vessels
- Cardiac arrhythmias
- Damaging pancreatic cells – DM
- No association found to fertility with ESWL

❖ Renal Effect:

1. Haematuria

Rapture of blood vessels

Glomerulae B.V. to arcuate

Initially it was thought due to irritation of stone to mucosa.

But not due to cavitary bubbles expand into B.U. leads to rupture of B.V.

Once Rupture → There is pool of blood. More B.V. damaging.

2. Perineal hematoma

3. Loss of function – volume loss

❖ Chronic Effect:

- | | |
|--------------------|---|
| 1. HT: | Due to micro vessel damage
Ham'g → healing leads to scar and myssenchymal proliferation
Leads to hypertension |
| 2. RFT: | Decrease renal plasma flow
Decrease RFT |
| 3. Race of Stone: | Due to high residual debris |
| 4. Brushite Stone: | Altering normal urinary pH level |

❖ No evidence exist to support long term damage by ESWL.

❖ Factors increasing ESWL trauma:

1. Juvenile kidney – Child
2. Number of shock
3. Period of shock
4. High voltage
5. ESWL generation
6. Per existing renal damage
7. DM, HT
8. CVS disease
9. Coagulopathy

❖ HOW TO IMPROVE ESWL OUTCOME?

- Proper selection of patient:
 - Stone <900 HU
 - Good lower pole anatomy
 - Lower pole infundibulum > 3cm
 - Width of infundibulum < 5mm
 - Infundibulum pelvic angel < 70
 - Single dependant calyx ‘
 - Infundibulum length: width > 7
- } Poor patient
- Analgesia – clearance rate
 - Slow frequency of shock: 60/min
 - So more time for bubbles to cavitation damage
 - Proper positioning
 - Acoustic coupling – low viscosity prevents air bubble function, USG ideal.
 - Intra procedure monitoring
 - Post procedure temsulisin
 - Ramping: Beginning ESWL with lower energy fiber higher energy
 - Initially 12 Kv → 24 KV
 - Slow lower energy: decrease damage by vasoconstriction
 - Procedure less pain and impower compliance



- PDI: Percussion Diuretics, Inversion
½ liter saline, percussion into tredlangburg position
Increase clearance of lower calyx stone
- ❖ **No construes on maximum shock given in single sitting and no construes on interval both shock therapy.**
- ❖ **Prior stenting: Doesn't improve stone free rate nor decrease ancillary procedure Only decrease steinstrasse rate.**
- ❖ **Ideal shock wave:**
 - 60/min
 - 3600 per hour
 - Two weeks gap between session
- No ideal antibiotic protocol for ESWL**
But as institutional protocol we give injectable single dose before ESWL
- ❖ Three generations of ESWL machine:
 1. Electro hydraulic: Spherical expanding shock
 2. Electro magnetic: Linear / Cylindrical shock
 3. Pizeoctrical: Plane shock wave
- ❖ **Imaging system in ESWL:**
 1. Floro:
 - Advantages:
 - Familiar to urologist
 - Intra procedure IVP can done
 - Radio opaque stone localization good
 - DisAdvantages:
 - Radiation exposure to patient and technician
 - Costly
 - Difficult to maintained
 - Inability to visualized radiolucent stone
 2. USG:
 - Advantages:
 - Localization of lucent stone
 - No radiation exposure
 - Easy to operate and maintenance
 - Disadvantages:
 - Once stone fragmented difficult to localized
 - Trained operator required
 3. Combined Floro & USR:
- ❖ **Role of Anaesthesia:**
 - Previously with HM3 instrument
 - Powerful shock generator used
 - Pain mostly at skin level – as power voltage at skin level
 - In children and anxious patient better to give anaesthesia
- ❖ Cystein, Calcium oxalate, CalciumPhosphate, Matrix – Most resistant to ESWL due to ductile structure without lead to high resistant to cruck.

❖ **Clinical insignificant residual after ESWL**

Define as:

1. Asymptomatic patient with sterile urine
2. Stone fragments < 4mm non obstructive, non infective

❖ **Success rate and stone free rate after ESWL are different.**

Success rate: Includes cases of insignificant residual also. So it is high

Stone free rate: Low then success rate note having even insignificant residue.

CT is best to diagnosed it.

STAINSTRASSE

- Street of stones
- Impaction of stone in ureter following ESWL

❖ **COAPTATE Classification:**

1. Leading stone 2mm
2. Leading stone 4-5mm rest small stone tail
3. All large leading stones

❖ **Management options:**

1. Observation
2. Intervention

➔ Asymptomatic and normal RFT – Conservative

➔ Symptomatic	}	Intervention ↓ PCN diversion followed by URSL
➔ Obstruction		
➔ SFK		
➔ Sever colic		
➔ Increase RFT		

❖ **Pre operative DJ stenting doesn't prevent S.S. but can reduced cx of stainstrasse.**

❖ **High risk for stain strasse:**

1. Pelvic stone > 2cm
2. No relation to age, sex and race

MET

(Medical Expulsion therapy)


Administration of medicines to relax ureter and allow spontaneous passage of ureteric stone.

❖ **Indication of MET:**

1. Well informed patient
2. Tolerable symptoms without UTI
3. Small ureteric stone < 10mm

❖ **C/I for MET:**

1. SFK
2. UTI
3. Intractable pain
4. Impaired RFT

 ❖ Spontaneous passage of stone depends on:

1. Location
2. Transverse distance of stone
3. Dilatation above stone

Upper ureteric:	50%	< 5mm	75% Rate
Lower ureteric:	75%	> 5mm	50% Rate

❖ **Alphablockers:**

Rationale: Relaxation of L/U smooth muscle, α 1A receptor.

Tamsulosin

Fewer Colics, high rate of spontaneous passage and better ADR profile.

❖ **CCB:**

Nifedipine – smooth muscle relaxant

❖ **Phosphor diesterase 5 inhibitors:**

Tadalafil

Basic of C-GMP pathway related smooth muscle relaxant.

Newer for this indication

❖ **Deflazocort:**

Decrease inflammation and oedema association with stone

6mg TDS

No proven RCT trials

❖ **With MET we can wait upto 4 weeks if no C/I**

❖ **Ureteric Colic:**

Intermittent: When stone passed from kidney to ureter it increase intra pelvic pressure → stretch pelvis and renal capsule - present at colic.

Increased intra luminal pressure will increase hydrostatic pressure and failure of peristalsis. Pressure will decrease and resolution of pain. Further movement of stone down into ureter – relieves pressure once again it stuck somewhere and again colic pain. So it is intermittent.

❖ **Altered RFT in ureteric stone causes:**

- | | | |
|---|---|----------------------|
| <ol style="list-style-type: none"> 1. Obstruction 2. Dehydration 3. Sepsis 4. Nephrotoxic drugs 5. SFK | } | in C/L normal kidney |
|---|---|----------------------|

❖ **In PCNL:**

- Urine culture is must
- Sterile culture doesn't R/o post PCNL septicemia.

As:

1. Stone harbors bacteria and bacteriuria is intermittent
2. Fragmentation of stone may release preform endotoxins.

So sterile culture doesn't guarantees post PCNL sepsis.

❖ **PCNL preferred anaesthesia is General Anaesthesia.**

Spinal anaesthesia: Atleast T₈ level should block

It supracostal T₆ must be block

D.Advantages:



- 1 High need of agent to block pain

2. It doesn't guarantee against vagal shock
3. Discomfort to patient during operation
4. R/S is not under controlled
5. If T₄ block → bradycardia can happen

❖ Irrigation Pressure:

PCNL:

- 80mmHg physiological solution NS
- Amplatz sheath provides prevention of intra pelvic pressure raising

URS: High pressure can lead to-

- Migration of stones
- Bacterimia and sepsis
- More fluid absorption – close system

❖ At end of PCNL furosamide should be given

- To prevent and maintain diuresis
- To wash out clots

❖ Tranexa can clot the blood but the clots become more sticky. It can block DJ stent too.

❖ Factors which lead to RFT deterioration after PCNL:

1. Stone burden > 1500mm
2. PT < 5mm
3. Recurrent UTI
4. Age < 15 years

❖ URSL in stricture / stenosis ureter:

- Not all narrow points are stricture
- It can be spasm or inflammatory reaction
- Never over dilute ureter – it can damage the ureter
- Put DJ stent if ureter seems to be in spasm

If proper stricture: open / laparoscopic management of stricture with stone removal

OR

Endopyelotomy and stone removal

Always first do endopyelotomy

OR

Endoureterotomy

Put DJ stent – healing

Then stone management

If both done simultaneously → stone may migrate periureteric tissue leads to granuloma – further stricture.

❖ In SFK put DJ stent after URSL:

As

- | | | |
|---|---|---------------------------|
| <ol style="list-style-type: none"> 1. Ureter can have spasm 2. Small clots 3. Fragments 4. To overcome temporary oedema | } | all can cause obstruction |
|---|---|---------------------------|

❖ Indication of DJ stenting following URSL:

1. SFK
2. Perforation



3. Significant oedema
4. Pre operative ureteric dilatation
5. Infected system
6. Large stone with possible residual fragments

No consensus for ideal timing of DJ stenting, but 1-3 week is ideal

❖ **What is parallax ?**

In PCNL after initial needle puncture

If the needle is in PCS then on rotation of C-Arm needle tip and calyx will move in unison and scan close together. This basic fluoroscopic principle is known as parallax.

COMPLICATION OF URS

1. Perforation of Ureter: 0-4%

Causes:

- Over dilatation of ureter
- Forcefull insertion of URS scope
- During stone fragmentation
- Mismatch manipulation of stone

After perforation is identified don't do anything

Put only DJ stent for four weeks

If URSL is not progressive OR difficult to progress – Put DJ stent and stage the procedure.

2. Submucosal Stone:

- Must be removed with laser
- Put DJ stent
- If left alone it can cause stricture

3. Lost Stone:

- Don't try to remove it
- Put DJ stent
- Explained relatives and mention in notes

4. Avulsion: 0-0.5%

- Very rare
- proximal 1/3 ureter poor muscular backing
- Due to blind basketing
OR
- Forcefull manipulation of large impacted stone

TREXER Classification:

- i. – No ureteric lesion only mucosal patachie
- ii. – Mucosal erosion OR mucosal flap
- iii. – Muscular injury with spared adventitia
- iv. – Full Thickness injury with visible fat
- v. – Avulsion complete rupture of ends

Treatment:

- Put nephrostomy first
- Later definitive management

❖ If basket engaging into stone can't retrieved what to do?

- It should be replaced more proximally.

- If not than basket should disassembled and URS pushed along guidewire
- Stone in basket break and remove basket

5. Stricture:

Causes:

- Ureteric perforation
- Submucosal stone
- Thermal injury to wall
- Ischemia to wall
- Impacted stone
 - ↓
 - If stone doesn't allow to pass RGC / guidewire, then it is known as impacted stone.
 - If stone doesn't expulsion within 4 weeks then must be suggestive treatment.

❖ Clavian Dindo classification for Cx (Modified)

1. Deviated from normal course without any radiological OR pharmacological intervention (wound infection)
2. Requiring pharmacological intervention (B.T.)
3. IIIa: Intervention without general anaesthesia
IIIb: Intervention with anaesthesia
4. Life threatening complication needs ICU admission
 - 4a: Single organ failure
 - 4b: Multi organ failure
5. Death from Cx

METABOLIC EVALUATION AND RECURRENT PREVENTION

Stone Analysis

Stone analysis is done most commonly now with FT-IR.

Multiple methods are available for stone analysis.

1. Dry weight method
2. Chemical analysis
3. Thermogravimetric method
4. X-Ray diffraction:

Basic:

Every crystal has unique diffraction pattern. Which allow monochromatic x-ray to pass on stone from different direction and unique diffraction pattern is formed.

Advantages:

- Easy
- Quantitative

D. Advantages:

- High cost
- Non crystal stone can't identify.

5. Infrared spectroscopy:

Fine powder of stone is formed and transformed into tablet by adding pure potassium bromide.

IR cause atomic vibration consequently energy absorption and absorption band of IR of stone analysis.

Advantages:

- Easy



- Rapid and versatile method
- Non-crystalline strictures are also identified

Disadvantages:

- Time consuming
- Different to differentiate small quantity and compound having same absorption bands

❖ **FT-IR:**

- FT-IR is 3rd generation IR
- Having high signal to noise ratio.
- Scan range wide and timeless with high resolution

❖ 4 samples from core, surface, cross section, and mixture of all must be taken for examination.

Urine 24 hour evaluation:

❖ **In whom it should be done?**

In Indian subcontinent majority of stones are environmental in origin.

While in western world majority of due to metabolic causes so for them any stone disease patient with high risk criteria must have urine analysis.

While in our region:

- **Bilateral Stone**
- **Multiple recurrent**
- **Family history**
- **Pediatric populations are indications for 24 hour urine analysis.**

❖ **What are the pre-requisites?**

1. Patient must be on normal diet
2. No gross haematuria
3. Should stop any stone preventive treatment
4. Calcium. Vitamin D supplement must be stop
5. Proper 24 hour urine collection

Timings of study:

Initial study:	Patient should be stone free and DJ stent free for atleast 21 days
Follow-up study:	After patient taking medicines for recurrent prevention

❖ **Test done:**

- 24 hour urine collection
- Ideally two consecutive 24 hours samples.
- But now single 24 hours urine sample can be suffice.

Spot Sampling:

- For pediatric population
- But rest result may varied on age, sex and collection method

❖ **24 hours urine collection method:**

1. Storage of urine $\leq 8^{\circ}\text{C}$ during storage
2. 5% thymol in isopropanol
3. 6% HCL to prevent prepetition
4. 10 gm boric acid in container

Recent commercial available kits provide collector without need for refrigerator during transport or collection

❖ Why **urine acidification** needed during storage?

- To keep CaOx and CaPO_4 dissolved
- To prevent bacterial growth
- Prevents conversion of ascorbate to oxalates

❖ Adequacy of 24 hours urine sample should be checked by urine creatinine level.

Male: 25-25mg/Kg/Day

Female: 15-20mg/Kg/Day

❖ Parameters checked and normal values:

Urine Volume	> 2 L/ day
pH	5.5 – 6.5 Normal
Sodium	
Chloride	
Calcium	> 5.0 mmol/day abnormal
Uric Acid	> 4.0 mmol/day abnormal
Citrate	< 2.5 mmol/day abnormal
Oxalate	> 0.5 mmol/day abnormal
Magnesium	< 3.0 mmol/day
Cystein	> 8.0 mmol/day abnormal
Ammonium	> 50 mmol/day abnormal

❖ Extended Metabolic Coevaluation

- 2 – 24 hours urine analysis
 - 1 on normal diet
 - 1 on restricted diet
- 1 – Calcium load test

❖ **Calcium Load Test:**

Patient adherent to strict diet

After NBM – 300ml water from 9 to 12 pm previous day

And 2 hours before load give more 600ml water to drink

Urine passed within these two hours collected = Fasting urine calcium

After 1gm calcium load: urine collected for 4 hours = loading urine calcium

Fasting urine calcium : in mg/mg of creatinine. Reflects GFR.

Loading calcium: mg/mg of creat. It reflects function of fixed oral calcium load.

Ionized serum calcium:

Half of calcium binds to albumin.

For homeostasis ionized calcium is important.

Total calcium = bound + ionized

Ionized calcium = measured calcium – (0.8 × (4.5 – s. albumin))

Normal: 4.5 to 5.2 mg/dl.

❖ **Recurrence prevention general measures**

- Fluid amount > 3.5 L/ day
- Normal pH beverages
- Water hardness has little to do with stone recurrence
- Carbonated water with citrate – prevention against stone
- Soda with phosphoric acid : stone progression
- Citrous juice

- Lemonade (more citric acid reduce stone rate)
- Orange juice (more citric acid reduce stone rate)

Diet: Balanced Diet

- Daily sodium < 3.5gm
 - 1) As calcium excretion increase by decrease tubular reabsorption.
 - 2) Urinary citrate decrease under due to loss of bicarbonate.
 - 3) Increase sodium urate crystal formation by excessive sodium.
- Food rich in vegetable and fibers
- Excessive oxalate avoided: Cheese, chocolate, spinach, tea, nuts
- Vitamin C encourage: although excessive vitamin C is a precursor of oxalates but not proven
- Animal food decrease amount to reduce hyperoxaluria, hyperuricosuria, low pH and hypocitraturia.

❖ Calcium Intake:

- Should not be restricted
- Daily amount: 1000-1200mg
- Calcium supplement are not recommended except enteric oxerluria
- If calcium supplements are taken take along with plenty of fluids.
- Taken along with food as it can chelate with oxalates. So no effective raise for S. Calcium
- Calcium citrate form is taken

❖ Cystinuria

AR

Impaired transport of CoLA

Cystein ornithine, lysine, Arginine

Under absorption → more crystallization in urine

Factors affecting:

- No specific inhibitor
 - Concentration > 250gm/L → crystallization
 - Increase pH - increase solubility
 - Increase ionic strength increase solubility
 - Associated Abnormality
 - a) Hypocitaturia
 - b) Hypomagnesemia

Treatment to form drug – Cystein complex which is more soluble

- 1) D – Panacillamine – 250mg/day
More cytopenia, nephritic syndrome
- 2) Thiols – 100mg BD
- 3) Captopril – 100mg/day – Dry cough, hypotension
- 4) Low methionine diet
- 5) Potassium Chloride
- 6) Tiopronin more ADR

Hypercalciuria

> 200mg/day / urine calcium after adherence to 400mg calcium and 100mg Na for 1 week defines as hypercalciuria.

Male: > 7 mmol/day

Female: > 6 mmol/day

❖ Types of hypercalciurea:

1) **Absorptive:** Increase absorption from GIT

Type I : Diet unresponsive

Type II : Diet responsive

Type III : Renal phosphate leak

Urine calcium increase but S. calcium – normal

As diet calcium increase → decrease PTH → decrease reabsorption of calcium from kidney

Increase calcium in urine

Decrease calcium in serum

2) **Resorptive:**

Increase PTH → increase bone resorption
Increase calcium absorption

Hypercalcaemia

Hypercalciuria

Hyperparathyroidism:

Suspect in

- a) Family history of stone
- b) Recurrent stone
- c) Bilateral staghorn stone
- d) Multiple bilateral stone
- e) Increase s. calcium level

Investigation:

- a) S. Calcium
- b) S. Phosphate
- c) I. PTH - - Biological Active Form

Treatment:

- a) Hydration
- b) Decrease calcium intake
- c) Biphosphonates

Surgery: Parathyroidectomy –

Indication:

- a) **Recurrent urinary stone**
- b) **S. Calcium - 11.5 mg/dl**
- c) **Deteriorating RFT**
- d) **Symptomatic hypercalcaemia**
- e) **Soft tissue calcification**
- f)

Explained before surgery to patient –

- a) Metabolic cure can't achieved
- b) Permanent hypoparathyroidism
- c) RLN damage

3) **Renal Hypercalciuria**

- a) Baren syndrome
- b) Dentz syndrome

4) **Idiopathic:**

5) **Miscellaneous:**

- a) Sarcomatoid disease
- b) Steroids

c) Malignancy

❖ What is thiazine challenge test?

Test to differentiate renal calcium leak and primary hyperparathyroidism with normal S. Calcium
Thiazide increase calcium absorption – so with increase S. Calcium PTH level normal S/o phosphate leak.

With increase S. Calcium level increase PTH → S/o. Hyper parathyroidism

Management:

Resorptive Hypercalciuria: Surgery

Absorptive:

- | | |
|----------|--|
| Type I | : Diet, Fluid
Thiazide |
| Type II | : Very mild form
Doesn't require any surgery
Orthophosphates can be used
Thiazide are not specific for AH type I
As they can't decrease GI absorption of calcium
But they increase calcium re-absorption. |
| Type III | : Thiazide Drug of choice. |

ADR:

- Hypotension
- Hypokalemia
- Muscle cramp
- Increase bone density

❖ Drug Holiday:

As thiazide lost his hypocalciuria action but doesn't lose hypokalemic action.
So 3 months drug holiday after 6 months of treatment is needed.

Hyperoxaluria

- Urinary oxalates > 0.5mmol/day

1) **Primary Hyperoxaluria:** AR

Abnormality in glyoxalate metabolic pathway.

Normal conversion of glyoxalate to glycine prevented and conversion into oxalates.

Type I

- deficit in liver
- ALA enzyme deficiency (Alanine glyoxalate aminotransferase)
- ESRD by second disease
- Combine liver – kidney transplant

Type II

- GFHPR deficiency – Glyoxalate reductase
- GR is not liver specific
- Mild form
- Only renal transplant needed

Type III

- Very mild form

2) **Dietary Hyperoxaluria:**

- Oxalate rich diets
- Excessive vitamin C
- Increase animal protein

3) Enteric:

- Chronic diarrhea
- Ileal resection
- Short bowel
- GI bypass

- Fat malabsorption
Saponification of fat with calcium so less calcium available to chelate with oxalates.
- More oxalate absorption
- Poorly absorbed bile salts increase permeability of colon for oxalates.

Treatment:

- Avoid oxalate rich diet
- Alkalinisation
- Calcium supplement 0.25-1 gm
- Mg^{+2} supplements
- Pyridoxine
- Cholestyramine
- Oxalobacter formigenes tablets

Hyper Uricosuria

Humans have deficiency in uricase which convert uric acid to allantoin.

Uric Acid is weak Acid pK_a : 5.35

At $pH < 5.5$: Poorly soluble – precipitate
 $pH > 5.6$: Dissolve from increase monouric crystals

Etiology:

1. Low urine volume
2. Low urine pH
 - a) Increase acid production
 - b) Increase animal food
3. Hyperuricaemia:
 - a) Uric Acid $> 4\text{mmol/day}$
 - Enzyme deficiency : HGPRT deficiency
G-6P deficiency
 - URAT mutation
 - Uricosamic drugs:
 - a) Radioactive contrast
 - b) Chemotherapy
4. Gout, Tumor lysis syndrome

DM and Uric Acid stones:

Insulin responsible for ammonium genesis and for NH_4H channel which buffers acidity of urine

In insulin resistance patient, there is a defect in this pathway.

So acidity of urine is decrease and Uric acid is participated.



D/D:

Hyperuricosuric calcium stone

vs

Gouty diathesis

Increase urine uric acid
Normal pH
Calcium oxalate stone

Normal uric acid in urine
Low pH

Treatment:

Allopurinole

Febuxostate

Reismuricase – Recombinant uricase

Febuxostat

Allopurino

Xentaine
Oxidase
Inhibitors

- Non purine derivatives
- Excreted – liver
- In CKD can be given
- Decrease hypersensitivity reaction
- Decrease leukopenia
- More liver damage
- 40-120mg OD

- Purine
- Nonselective inhibitor
- Renal excretion
- Not given in CKD
- More hypersensitivity leukopenia
- 100-300mg TDS
- Less preferred

Renal Tubular Acidosis

- Clinical syndrome of metabolic acidosis due to abnormal handling of tubules leads to inability to acidify urine in presence of acidosis.

Type I:

Distal tubular acidosis

Defect in Chloride/bicarbonate transportation

H⁺/K⁺ transporter

May be idiopathic

OR

Autoimmune

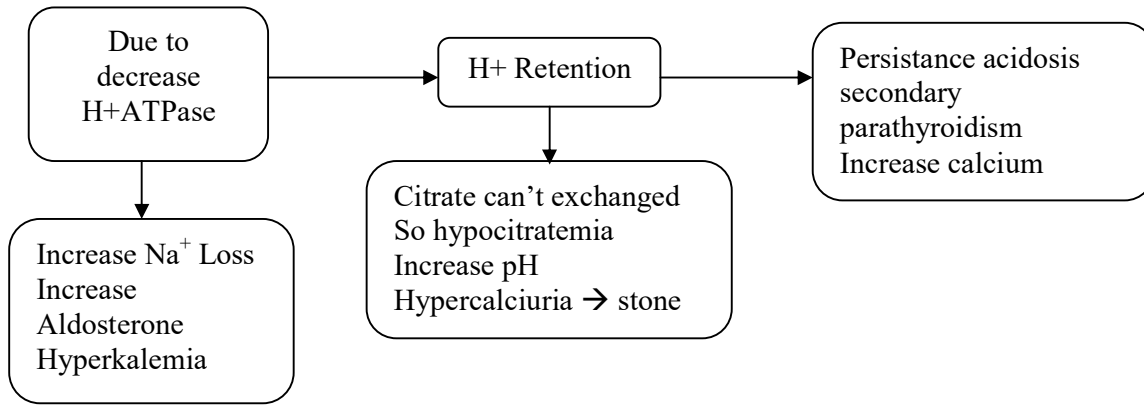
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Obstructive uropathy

Associated with:

- Hypokalemia
- Hyperchloremia
- Urine pH > 6
- Nephrocalcinosis, Nephrolithiasis





- ❖ Type II RTA:
Proximal RTA
Defect in bicarbonate reabsorption in PCT.
Hypokalemia
Hyperchloremia
Non anion gap acidosis
PH < 5.5

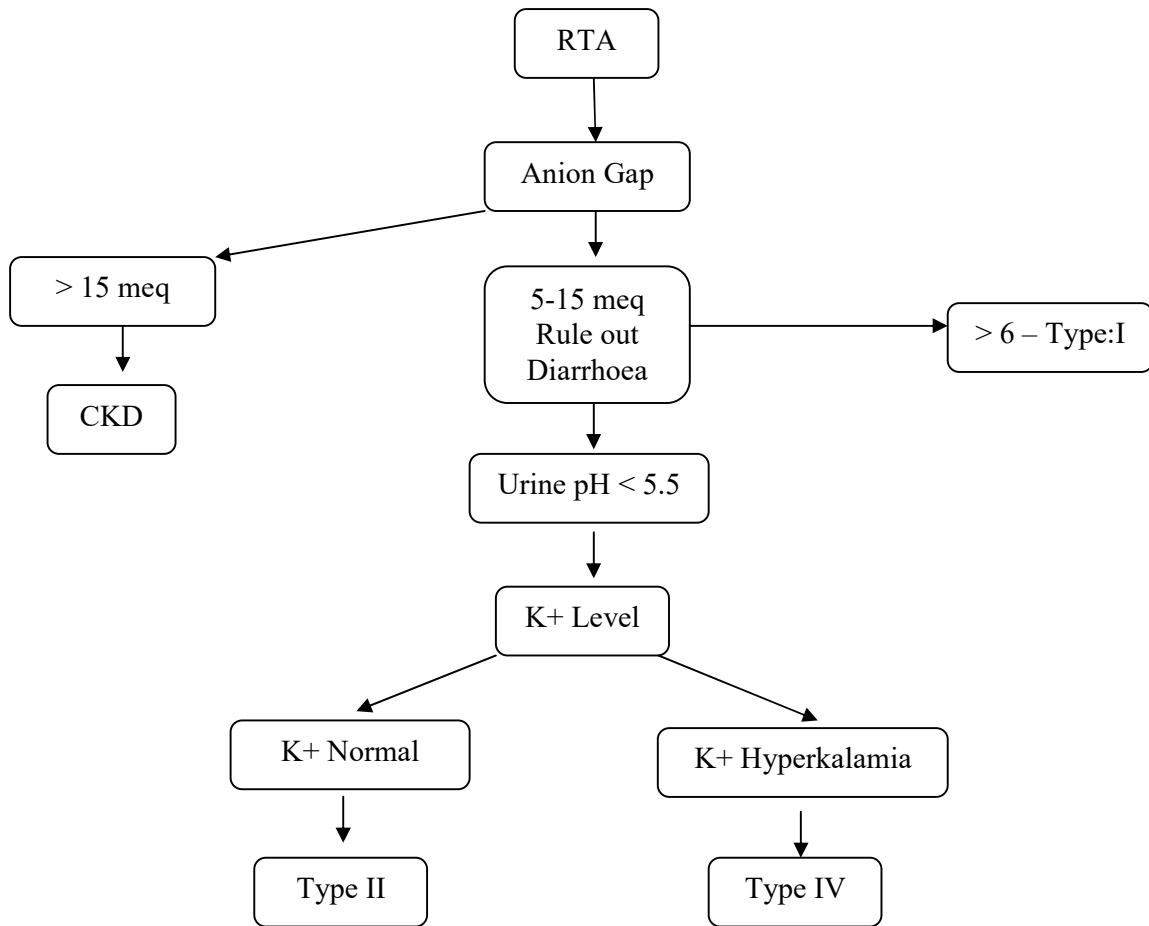
- ❖ Type IV RTA:
In CKD patient
No high risk for stone. As GFR decrease it leads to decrease solute load.
Hyperkalemia. Positive anion gap acidosis

❖ Nephrocalcinosis:

- Increase crystal deposition within cortex and medulla
- Hyper Parathyroidism
- Primary Hyperxaluria
- RTA
- Barter Disease
- Dent Disease

S. Cal. Phosphate S. Creatinine S. PHT X-Ray CT Scan	}	basic investigations required to diagnose nephrocalcinosis.
--	---	---





STRUVITE (STAGHORN) STONE

❖ High risk patient for struvite stone

- UTI with urea splitting organism
 - Alkaline pH of urine > 7.2
 - Ammonium rich environment
- } Pre-requisite

In:

- Neurogenic bladder
- Spinal cord injury patient
- Ileal conduit
- Foreign body
- Premature child or elder patient
- PUJ obstruction

❖ Organism associated with struvite stones:

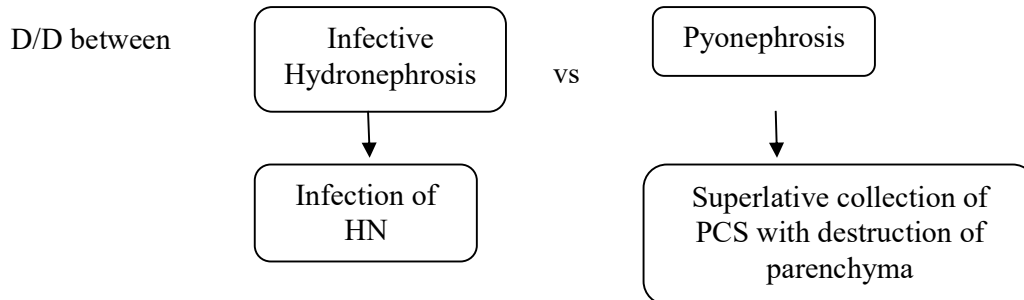
Obligatory urease producing:

- Proteus Sapprophyticus
- Providencia rattagiri
- Morganella morganii
- Uroplasma urolyticum,
- kleibsell
- Providencia



❖ **Complications of Staghorn Stones:**

- Urosepsis
- Pyelonephritis
- Pyonephrosis
- Perinephric abscess
- XGPN
- Nephrocutaneous Fistula



❖ **Dissolution treatment of staghorn calculus (Struvite)**
Chemolysis

- For poor surgical candidate
 1. Saby's G solution: Citric Acid, Magnesium Oxide
 2. Hemercidein: Saby's & Glucuronic AcidAcidic solution so decrease pH and solubility of struvite

C/I:

1. Positive culture and sensitivity
2. Fever
3. Persistent flank pain
4. Extravasation of irrigation

Method:

1. Inflow outflow nephrostomy
2. Inflow nephrostomy outflow PUC
3. Circle nephrostomy
4. Dual lumen foley

❖ **How to give?**

Preconditioning with saline infusion at 30ml/hour, If patient is afebrile, pain free then double the infusion rate upto 120ml/hour. After 24 hours you can give active solution. Monitor for culture and sensitivity 24 hourly

2days – x - ray monitor

Magnesium level

Irrigation must be given upto 24 hours after stone lost visibility.

❖ **Oral agents:**

1. Acetohydroxemic Acid 250mg TDS
2. Ammonium Chloride 1gm TDS
3. L-methionine 500mg TDS

❖ **Anticipatory problems during staghorn stone**

- Pre-op proper planning
- Pre-op proper selection of calyx most important
- Multi tract multi puncture
- Stage procedure
- Increase fever, blood transfusion
- Complete clearance is needed o.w. high recurrent rate



❖ Stone inhibitors:

1. Inorganic Phosphate
2. Citrate
 - Inhibitor for CaOx, CaPO₄ stones
 - chelates with calcium
 - Inhibits spontaneous crystallization
 - Prevents homogeneous crystallization
3. Mg⁺²
 - Complexion with oxalates
 - Decrease crystal growth
4. Nephrocalcin
5. Ostopontin
6. Glycosamino Glycans
7. Bikunin
8. T.H. Protein: Inhibitor & promoter both roles
 - Alkaline Urine : Inhibitor
 - Acidit Urine : Promoter

❖ Content of Alkalisor:

- | | | |
|-----------------------------|--------|-------|
| • K ⁺ Citrate: | 1100mg | } 5ml |
| • Mg ⁺² Citrate: | 37.5mg | |
| • Pyridoxine: | 20mg | |

❖ Pregnancy and Stone

Most common cause of nonobstructive pain during pregnancy

Risk Factors:

- Dilatation of urinary tract
 - hormonal / mechanical
- Increase renal blood flow to kidney increase GFR 20-25%
- Increase solute load for filtration
 - Increase Na⁺, Ca load
- Hypercalciuria due to decrease PTH
- Urinary pH also increase

But countering to that inhibitors in urine also increase, increase citrate in urine.

Treatment:

1st trimester very sensitive with radiation for organogenesis

USG with Doppler for urine jet

MRI: No ionic radiation

No CT scan or X-Ray

Management options:

- Asymptomatic: Conservative management
- Symptomatic:
 - Pain / UTI
 - ↓
 - DJ Stent can kept
 - Early encrustation
 - Repeatedly have to change until delivery



ESWL }
PCNL } C/I

URSL with FURS with laser lithotripsy can be done in second trimester.

❖ Enlist Cx of PCNL:

1. Position: Ocular injury
Spinal injury
Nephropraxia
2. Puncture: Injury to colon
Injury to spleen / Liver / Gall Bladder
3. PC System: Infundibulum perforation
Under / over dilatation
Pelvis perforation
4. Bleeding: Intra-op-
 - Due to infundibulum
 - Anterior calyx
 - Energy source
 - Torque on amplatz
5. Pneurothorax, Hydrothorax:
6. Air embolism
7. Infection, Sepsis
8. Delayed hem'g AVF, Fistula
9. Tube dislodgement
10. Lost of renal function

❖ **How will you manage post operative bleeding after PCNL?**

Intra operative: small parenchymal bleeding is stopped by renal compression. No role of nephrostomy if it is not larger in diameter than the tract size. Otherwise small nephrostomy will not have compression effect on parenchyma.

Usually surgery is uneventful then post operative hematuria will be resolved by 1 or 2 days.

If severe intra operative bleeding then put nephrostomy and terminate the procedure.

Monitor patient in ICU.

Give iv fluids.

Role of tranexamic acid still not defined.

Reactionary hem'ge is mostly due to arteriovenous fistula or malformation. In that case to initially conservative management can be done. Persistent bleeding and drop in hematocrit warrants urgent angiography and coiling of fistula. In very few cases nephrectomy is required.

Secondary hem'ge is mostly due to infection. Conservative management along with antibiotics are required for such cases.

❖ **How will you manage post operative fever after PCNL?**

Post operative fever may be reactionary, systemic inflammatory reaction or due to sepsis.

Conservative management with IV fluids, antibiotics and supportive measures are required.

Usually higher antibiotics are needed.

Monitor for vitals and leukocytes count.



❖ **How will you manage post operative breathlessness after PCNL?**

Post operative breathlessness after PCNL may be due to severe pain, pneumothorax, hydrothorax, air embolism or due to cardiac event.

Majority of time it is mostly due to pain and resolved with analgesics.

Post operative x ray chest is required and if needed inter costal drainage is needed.

Also look for other causes also.

CHAPTER

2

Benign Prostatic Hyperplasia (BPH) and Transurethral Resection of Prostate (TURP)

Symptomatology and Investigations:

- **Normal frequency of voiding:** 5-6 times / day with almost 300ml/void
- **Dysuria:** Painful urination
Pain mostly at tip of meatus
- **Hesitancy:** Delay in starting of micturition
Normal voiding started within seconds of relaxing
spincters.
- **Straining:** Contraction of abdominal musculation which increase
intravasical pressure
- **Intermittency:** Involuntary stop-start of micturition due to intermediate
obstruction of flow
Mostly due to
 - ✓ Median Lobe
 - ✓ Bladder Stone
- **Terminal Dribbling:** Continuous with main flow of urine
- **Post Void Dribbling:** Involuntary loss of drops after individual completing
voiding
Due to failure of normal milk back mechanism.
Normal urine between BN and ext. spincter goes back
into bladder after voiding, but in bladder outflow
obstruction it doesn't. So when ext. spincter relaxes post
void dribbling occurs.
- **Nocturia:** ≥ 1 void during period of sleep
Voiding preceded and followed by sleep
Every morning void after wakening is not nocturia

Causes of increase frequency in BPH

- Residual Urine
- Detrusor Overactive
- Compliance decrease

Nocturia in BPH

- Increase formation of urine in old age due to decrease conc. ability
- High PVR
- Compliance Decrease
- Association with Diabetes Mellitus

BPH cause primary obstructive symptoms. Never suspect BPH in patient with primary storage symptoms in absence of obstructive symptoms.



Storage Symptoms:

- Frequency
- Urgency
- Nocturia

Voiding Symptoms:

- Weak Stream
- Intermittency
- Incomplete Emptying
- Hesitancy
- Straining

D/D of obstructive LUTS in old male:

- 1) BPH
- 2) Urethral Stricture
- 3) BPH with Stone
- 4) Ca Prostate
- 5) Neurogenic Bladder
- 6) Rarely Bladder Tumor
- 7) Posterior Urethral Stone

D/D of storage LUTS in old male:

- 1) BPH
- 2) GU TB
- 3) Bladder Mass
- 4) Neurogenic Bladder
- 5) Bladder Stone

IPSS: (7 Symptoms)

- ✓ 4 Obstructive
- ✓ 3 Irritative LUTS

Advantage of IPSS:

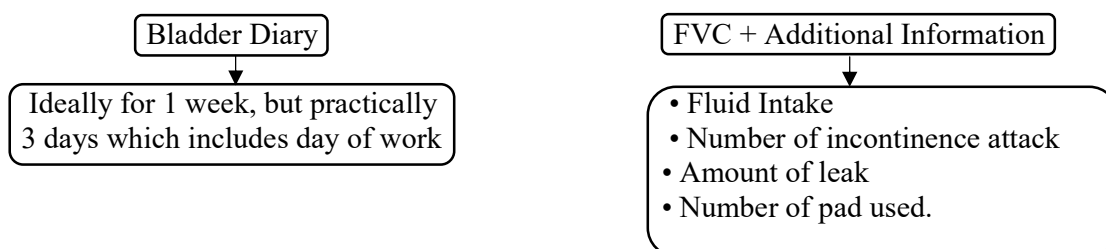
- 1) Access Baseline Symptoms
- 2) Access Response to Therapy
- 3) Detect Symptom Progression in W/W

D. Advantage of IPSS:

- 1) Recall BIAS
- 2) Incontinence and post micturition symptoms not included
- 3) No provision for bothersome caused by individual symptoms
- 4) Patient with poor intelligence difficult to interpret IPSS.

Frequency Volume Chart:

- Requires for all patients with LUTS
- Records volume and time of each voiding.



Information derived from bladder diary:

- 1) Rough bladder capacity
- 2) Total voided volume
- 3) Night frequency
- 4) Frequency
- 5) Nocturia polyuria index (NPI)

$$\text{Nocturia Index} = \frac{\text{Nocturnal Urinary Volume}}{\text{Maximum Voided Volume}} \quad \text{If } > 1 \text{ then Nocturia occurs.}$$

$$\text{NPI} = \frac{\text{Nocturnal Urinary Volume}}{\text{Total Urinary Volume}} > 0.2 - 0.33$$

Nocturnal polyurea Suggestive of nocturnal polyuria

- ❖ **DRE (Digital Rectal Examination):** Simplest way to assess prostatic volume
Prostate size doesn't correlate with
 - ✓ Symptoms severity
 - ✓ Degree of obstruction
 - ✓ Treatment outcome
- ❖ **DRE underestimates and overestimates prostate size**
 - Overestimate small glands and 25-30% underestimates large glands

What to see in DRE ??

- Prostate size grade
- Consistency
- Palpability above prostate if possible
- Fixity
- Mucosa –
 - ✓ Free
 - ✓ fixed
- Anal tone
- Perianal sensation

Position for DRE ??

1. Lateral position (knee, chest position)
 - ✓ Best in OPD
2. Lithotomy position
3. Standing position –
 - ✓ Bent over table at waist with knee slightly flexed, Feet's are apart and toes pointed inwards
 - ✓ Awkward position

❖ **Initial evaluation in BPH:**

- History
- IPSS
- DRE
- Serum Creatinine
- Urine Routine & Micro
- S. PSA

❖ **Why Serum Creatinine in initial work up ?**



1. 10% patients may have silent HUN

2. Increase serum creatinine may increase complications and morbidity of TURP
3. No symptoms score and QOL predicts renal deterioration.

❖ **Role of PSA in BPH:**

1. Can diagnose Ca Prostate and altered management of LUTS
2. $>2.5\text{ng/ml}$ PSA – is high risk for progression of BPH
3. $>1.6\text{ng/ml}$ PSA – more risk for AUR
4. With 5 alpha reductase inhibitors decrease S.PSA after 6 months of treatment

AGE specific S.PSA for Asian males:

40-49 years	$<2\text{ng/ml}$
50-59 years	$<3\text{ng/ml}$
60-69 years	$<4\text{ng/ml}$
>70 years	$>6\text{ng/ml}$

Urine analysis to identify: UTI and microhematuria

If patient have mild symptoms OR moderate symptoms with minimum bothersome – Nothing more needed.

UROFLOWMETRY

Uroflowmetry is a screening method not diagnostic method

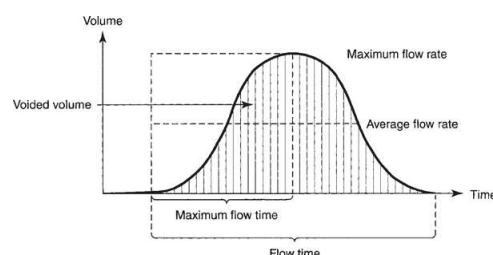
- $>130\text{cc}$ voided volume needed for acceptable uroflow report
- $<130\text{cc}$ or $>400\text{cc}$ voided volume not ideal for uroflow report
- As the flow is the function of volume so minimum 130ml volume is needed and $>400\text{cc}$ efficiency of detrusor begins to decrease so Q_{max} lowers.
- Uroflow measures: flow of urine over time – Noninvasive method

❖ **It Detects:**

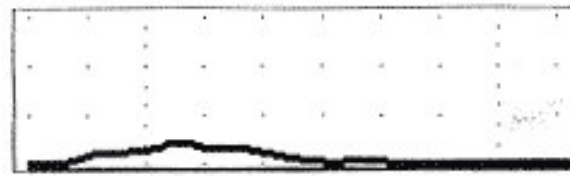
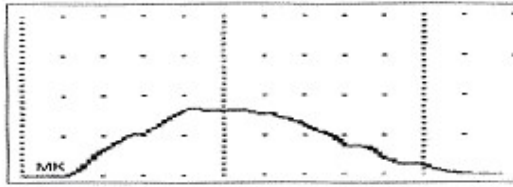
- Total amount of urine voided
- Total time of voiding
- Q_{max}
- Q_{ave}
- Time to max flow
- Hesitancy time
- Pattern of curve

❖ **What is normal uroflow curve??**

- Bell shaped.
- 45% of urine void before Q_{max} achieved.
- Q_{max} must be achieved within 1/3 of total voiding time.
- Q_{ave} should be of 1/2 of Q_{max} .

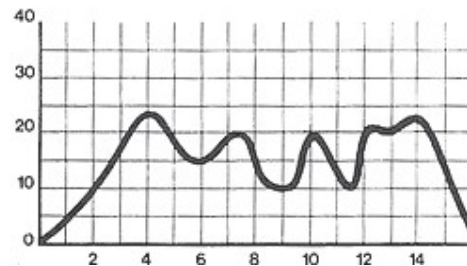


❖ Various patterns of uroflow curve



- (1) **Suppressed peak:** Obstructive or D.U.A.
 - Low maximum & low average flow
 - Max. rate achieved quickly and slow decreased
 Pronounce tail of reduced flow

- (2) **Box Type / Plateau Curve**
 - Stricture urethra
 - Little change of flow rate
 - $Q_{max} = Q_{Auc}$



- (3) **Interrupted Flow**
 - Irregular flow pattern
 - DUA
 - Straining

❖ **Artifact in Uroflowmetry:**

1. Cruising: Moving of stream in relation to central axis from funnel.
Peak and valley
2. Squeezing: Series of peaks due to squeezing of glans, when stop squeezing → Obstructive pattern.
3. Superflow: In women with incontinence the urethral resistance is low → Resulting in very high flow rate. K/a Superflow.

❖ **Uroflowmetry Instruments Types**

1. Load Cell Type: Relays on urine falls on pressure transducer.
2. Spinning Disc Type: Change in velocity of spinning disc.

❖ **Age wise Normal Uroflow Rate**

	Male		Female
< 40 years	- 22ml/sec	< 50 year	> 25ml/sec
40-60 years	- 18ml/sec	> 50 year	> 18ml/sec
> 60 years	- 13ml/sec		

❖ D. Advantage of Uroflowmetry:

1. Doesn't take consideration of volume
2. Qmax is only important factor
3. Post micturation dribbling can give false result.
4. Can't differentiate artifacts.

- Qmax >15ml/sec has poor treatment outcome then Qmax <15ml/sec.
- Qmax low doesn't R/o UAD or BOO.
- Qmax is more important than QAverage.

Post Void Residual

- Normal there should be no PVR or < 5ml.
- > 30% of voided volume is considered as significant PVR.
- Measurement of PVR:
 - Invasive: Catheterization
 - Non Invasive: Transabdominal USG.
 -
- PVR doesn't co-related with symptoms.
- Large PVR is not C/I for W/W but it relating with poor outcome.
- It is not clear weather PVR co-relates with outcome of surgery.

❖ USG KUB Indications:

1. Raised Serum Creatinine
2. Urinary Tract Infection
3. Past History of Stone Disease
4. Past History of Urinary Tract Surgery
5. Haematuria

❖ Cystoscopy Indications:

1. Prior pelvic surgery
2. Surgery of stricture
3. Haematuria
4. Severe storage LUTS to rule out Ca

Prostate Size and Grading:

❖ Why Size Important?

1. Size is a prognosis factor for disease progression and complication due to BPH
2. Treatment modality depends upon size of prostate
3. Before starting of 5 alpha reductase inhibitors.
4. Medical therapy can be add on for size
 - < 40cc : α blockers
 - > 40cc : α blockers + 5 ARI.
5. For PSA density

1. DRE:

Overestimates OR Underestimates
Most useful for consistency of gland



2. Trans abdominal USG:
 - Prostate volume = $\pi / 2$ LBW
 - Prostate volume depends upon bladder volume
 - Bladder should be 100-200cc full
 - Transitional zone can't measured
3. Trans Rectal:
 - Transitional zone can measured
4. Trans Perineal:
 - High false result
5. Planimetry:
 - Most accurate
 - USG probe mounted on stepping device
 - Time consuming / costly
6. Automated pressure circle area ratio (PCAR)
7. 3D USG:
 - Costly
8. MRI:
 - Endorectal Coil
9. CT Scan:
 - Overestimating by 30%

❖ Prostate Grading:

Grade	BPH Weight of Gland	DRE Encroaching into Rectum	Post Urethral Length Scopy	Scopy Lobes appearance	USG Gland appearance
N	10gm	0-1cm	1-2cm	Concave	Doesn't covers trigon
I	10-20gm	1-2cm	2-3cm	Bulges without midline touches	Covers ½ trigon
II	20-50gm	2-3cm	3-4cm	Midline touches	> ½ trigon
III	50-125gm	3-4cm	4-5cm	Touch for 2- 3cm	Almost covers trigon
IV	>125gm	>4cm	>5cm	>3cm touch	Upto fundus

* By median lobe: KT FOO

(I) <5mm IVP (II) 5-10mm (III) >10mm IVP

❖ Indications of UDM in LUTS / BPE patient

- 1) Previous failed treatment for LUTS (Invasive)
- 2) PVR >300cc
- 3) Qmax >15ml and severe bothersome symptoms
- 4) Patient who can't void >150cc volume
- 5) Considered for invasive treatment in male <50 years OR >80 years
- 6) Suspecting neurogenic bladder

❖ Nitti's Principles for UDM

1. Study that doesn't duplicate patient's symptoms is not useful
2. Not all detected abnormality is significant
3. Failure to record abnormality doesn't rule out its presence.

❖ **Brief details of UDM (Asked in exams)**

Intravesical Pressure = Intraabdominal + Detrusor Pressure

Intraabdominal pressure measures to know weather changes seen in Pves are due to contraction of bladder or due to abdominal straining.

$$P_{det} = P_{ves} - P_{abdo}$$

- If
- Pves increase, Pdet increase, Pabdo Normal = Detrusor contraction
 - Pves increase, Pdet Normal, Increase = Straining
 - Pves increase, Pdet increase, Pabdo Increase = Contraction + Straining

❖ **Types of pressure transducers:**

Pressure transducer convert pressure into electronic signals which can magnified to record it.

1. Pressure Transducer standard type

- Mounted on stand and connected to water fill tubes.
- Cheap
- More artifact

2. Catheter Tip: Transducer on tip. No artifact costly

❖ **Two important things in UDM**

1. Starting Zero: Zero pressure is an atmosphere pressure
Never set in bladder
Set at atmosphere pressure

2. Calibration of Tubes

- Cough Test: To determine measurement artifact. Unequally transmission of pressure on Pves and Pdet than catheter must be flushed.
Even after that it remains same → catheter position must be checked.

- Filling ideally to be done from SPC – Physiologically and Pdet perurethrally OR by side of SPC

Ideal Flow Rate: 10ml/sec
OR
10% of bladder capacity

- ❖ 1st Sensation: Difficult to access with PUC

- ❖ 1st Desire: 75% of BC

❖ **If Pdet too high before test:**

- Pabdo low
OR
- Pves high

Pves too high before test

- Catheter not in bladder
- Sensor not at symphysis level
- Pves too low before test
 - Air bubble
 - Catheter kink

- ❖ Pabdo too high before test
 - More water in balloon
 - Catheter in fecal material

- ❖ A/G Ratio: For B.O.O.

$P_{detmax} - 2Q_{max}$	>20	Normal
	20-40	Equivocal
	>40	Obstructed

- ❖ BCI (Bladder Contractile Index)

$P_{dexmax} + 5Q_{max}$	>150	Normal
	150-100	Equivocal
	<100	UAD

- ❖ How to measure IVPP ??

- Distance between the tip of median lobe to bladder neck in midsagittal plane using suprapubic USG probe with partially full bladder.

- ❖ Bladder wall thickness and detrusor wall thickness:

BWT: Distance between mucosa and adventitia

DWT: Distance between two hypoecho area

Normal BWT 5mm at 150-200CC bladder fullness

- ❖ Predictors for progression of BPH

- 1) Prostate >30cc
- 2) PSA > 15ng/ml
- 3) Moderate to severe IPSS
- 4) Age > 60 years
- 5) $Q_{max} < 12\text{ml/sec}$

- ❖ Silent Obstructive BPH

- Patient who is asymptotically / minimally symptomatic for BPE develops renal failure / upper tract changes due to BOO.

AUR / CUR

- ❖ Retention of Urine: Inability to empty bladder to completion
- ❖ AUR: Sudden painful inability to void.
10% male > 70 years have AUR.
Spontaneous AUR more in old age.

- ❖ AUR:
 - Spontaneous: No underlying precipitating factors
 - Precipitating: Trigger by some event

- ❖ Pathogenesis:

- 1) Prostatic Infarct.
Inflammation leads to neurogenic disturbances
Under relaxation of urethra.
- 2) Increase adrenergic stimulation.
- 3) Decrease stroma – Epithelial ratio.
- 4) Increased inflammation



Recent studies are suggestive of prostatic inflammation is most important cause for AUR in BPH.

❖ **Risk factors for AUR:**

- 1) Age > 70 years
- 2) Presence of LUTS
- 3) Moderate / severe IPSS
- 4) $Q_{max} < 12\text{ml/sec}$
- 5) $\text{PSA} > 1.4\text{ng/dl}$
- 6) Prostate volume > 40gms

TWOC

Rationale of Trial Without Catheter (TWOC)

- 1) Allows bladder to recover its contractility
- 2) Delay surgery to prevent risk of peri-operative morbidity

❖ **Success of TWOC**

1 st Day	44%
2 nd Day	53%
3 rd Day	62%

Ideal catheter should remove after 3-5 days.
> 7 days → Increase risk of UTI

❖ **What is successful TWOC??**

- 1) Voided within 6 hours of PUC removal
- 2) > 100cc urine with > 5ml/sec flow
- 3) <150cc PVR

But these criteria are not very well defined.

❖ **Factors for successful TWOC**

- 1) Lower age by < 65 years
- 2) UTI
- 3) $\text{PVR} < 100\text{cc}$
- 4) Precipitating cause present.

❖ **Best result in TWOC with silodocin**

- Rapidly acting

❖ **(Advice to read about ALFAUR TRIAL. It may asked in theory OR practical)**

❖ **TURP after AUR**

Increase risk of bleeding
Infection and post-operative morbidity



CUR

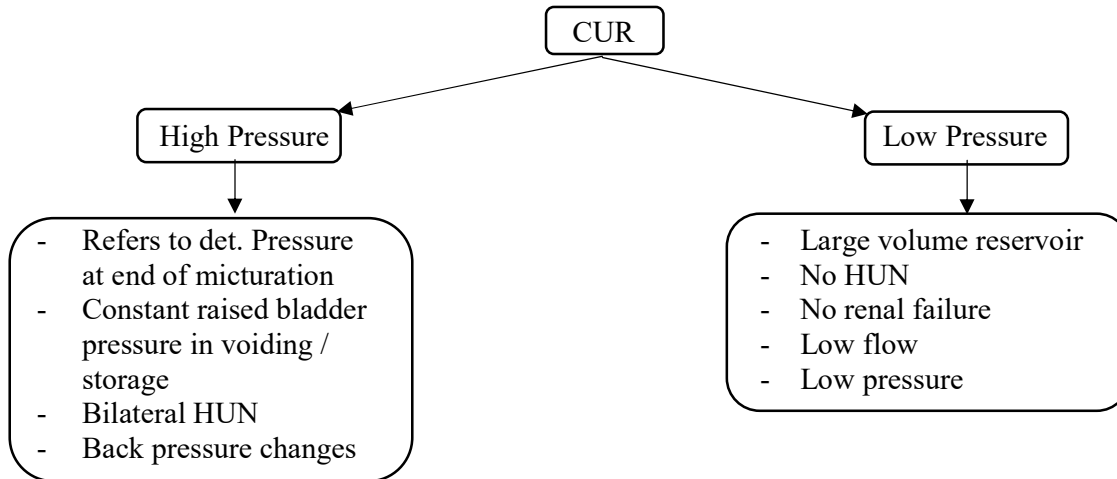
❖ Chronic Urinary Retention:

- Palpable non-painful bladder after patient has passed urine
OR
- Post void residue of >300cc.

❖ Indication of PUC in CUR

- 1) Upper tract changes
- 2) Deterioration of renal function

Else there is no need of PUC in CUR.



1) PUC vs SPC in CUR ??

- Patient's preference
- Advantage of SPC:
 - Less UTI
 - Less Stricture
 - Can have Intercourse

D. Advantage:

- 1) Bowel Injury
- 2) More trauma

2) UDS yes OR no??

- **Optional**
- **Even if, pre-operative UDM S/o unfavorable outcome 63% Patient can have benefit with surgery.**

3) Timing of UDS:

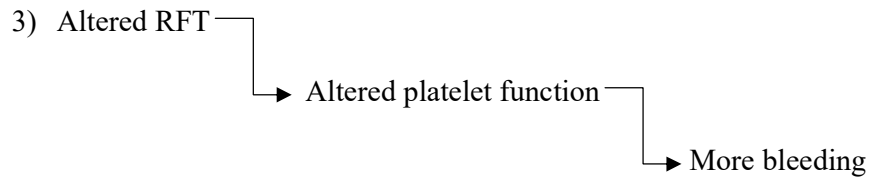
- **Ideally after 3-5 days of catheterization, when patient is stable.**
- **Post catheterization diuretics has taken care off.**
- **Bladder is decompressed.**

Our institutional protocol is to do after 14 days to give detrusor maximum rest.

➔ D. Adv of immediate surgery in HPCUR

- 1) Loss of local defense leads to more UTI
- 2) Impaired T cell function due to altered RFT





So, Advisable to decompress bladder for 1-2 weeks stabilized,
S. Creatinine < 2.5mg/dl, then do TURP

❖ **Complications of decompression in HPCUR**

1. Haematuria:
 - Renal tract decompression from calyx
 - Not severe enough
 - Spontaneous resolves within 24-48 hours
 - No role of slow decompression
2. Hypotension:
 - Decompression lead to vasodilatation → Hypotension
3. Post-Operative Diuresis:
 -

❖ **Role of Slow Decompression:**

- No standardized method
- Time consuming
- No added advantage
- As 50% of pressure raised is release within 100cc empty of urine
- Slow decompression can done by
 1. Hanging urobag above sym. PuBIS.
 2. Intermittent close open the catheter

MANAGEMENT

❖ **Indication of surgery for BPE:**

1. **Moderate to severe LUTS refractory to medical management**
2. **Recurrent painful AUR**
3. **Recurrent haematuria – After rule out other cause**
4. **Bladder stone with / without diverticulum**
5. **Significant PVR**
6. **Bilateral HUN with impaired RFT**
7. **Recurrent UTI from high PVR**
8. **Patient's preference**
9. **Median lobe projection > 10mm**
10. **Complications of medicines / cost of medical management**

❖ **When we can say failure of medical management?**

If any of below with continuation of medical management –

1. **4 points raised in AUA score**
2. **AUR**
3. **Urosepsis**
4. **≥ 2 UTI documented in a year**
5. **Raise of >50% S. Creatinine without any cause**
6. **Unacceptable incontinence**



❖ **How to decide modalities for BPE surgery?**

1. Patient's co-morbidity
2. Prostate size
3. Anticoagulation
4. Availability of / expertise of modality

❖ **Predictors of poor outcome with medical management?**

1. Age > 65 year
2. Prostate > 30cc
3. PVR > 100cc
4. PSA > 1.5mg/ml
5. Low peak flow

❖ **How will you counsel your patient before TURP?**

Explain patients about:

1. Why you need surgery ?
2. What are the other options ?
3. How I do it?
4. Complication / precautions for surgery.

These are four basic points of pre-operative counseling of any surgery.

- Explained about disease and give options for management
- Explained about retrograde ejaculation.
- Post-operative incontinence (even after normal surgery for some time)
- Post-operative haematuria and dysuria
- Need for PUC for 2-3 days
- Post-operative urine examination may show RBCs and Pus cells.

❖ **What are the post-operative advices on discharge?**

- Patient may pass some clots OR tissue bits for 1-2 days in urine.
- Dysuria for 1-2 weeks.
- Avoid straining – Provide stool softener.
- Avoid bike riding to avoid excessive perineal pressure.
- Avoid sex for 2-4 weeks.

❖ **Name various TURP techniques?**

1. Roger Barnes's
2. Neisbit
3. Alcock
4. Milner
5. Richard Notely
6. Holtegrove
7. Maurmeyer's

VARIOUS TURP TECHNIQUES

1) Roger Barne's:

- Resection 1st at 6 o'clock.
- If median lobe 1st resect it.
- Then 6 to 11 o'clock and 6 to 1 o'clock resection.
- Ant. Lobe resection last.



Advantage:

- Good flow of irrigation.
- Good resection for post lobe.
- For large gland one lobe can resected and left.

2) Neisbit:

- Based on arterial supply of prostate and aim to decrease bleeding.
- Resection begins 1st with intravesical portion.
- 1st make channle from 12 o'clock then working clockwise anti-clock wise.
- Bulk of lateral lobe falls on floor – resected
- Finally apical resection

Advantage:

- Easy resection.
- Easy control of blood supply – less bleeding.
- Very large gland with decrease blood loss can be done.

D. Advantage:

- Long learning curve.
- Expertize needed.
- Early perforation more likely ant. Portion – stage surgery.
- Lateral lobe crowding in urethra – poor flow.

3) Alcock Method:

- Complex procedure.
- Very large prostate.
- Lateral lobe floor resected so more bulk falls on floor to resect.

4) Richard Notely:

- After resection of median lobe, resection started from 7 o'clock to clock wise / anti-clock wise to complete upto 7 o'clock once again.
- Not convenient.
- Not popular.

5) Haltegroove:

- For very large prostate
- Large prostatic urethra
- Initially resected upto mid prostatic gland and then complete resection from mid prostatic to veru in 6 to 11 and 7 to 1 o'clock direction.

6) Milner:

- Initially groove made at 9 o'clock position to 11 and 9 to 7 o'clock
- Similar to opposite side.
- Post lobe and median lobe resected lastly.
- Finally 11 and 1 o'clock.

Advantage:

- Lastly ant. Lobe dissection less perforation.
- Initial groove at deepest lat. Lobes – mark boundary of resection.
- Increase speed of surgery.

D. Advantage:

- More bleeding

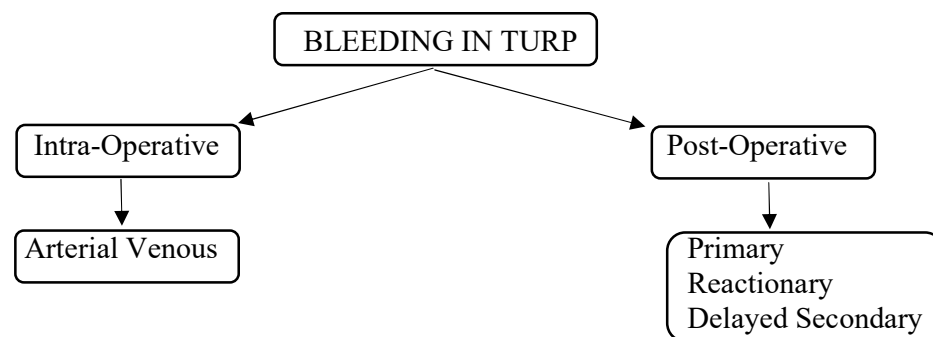
❖ **What is ideal complete TURP?**

- **At the end of resection**
 - **Very should stand alone**
 - **Circular wide open fossa**
 - **B.N. fibres visible**
 - **No protruding lateral lobes**
 - **Bilateral orifice visible**
 - **Pink coloured fluid effluent**

❖ **Balloon of PUC in TURP:**

- **Always at BN not in resection fossa.**
- **At BN along with traction it compresses the fossa and oozing from venous sources stops on compression (you can say your institute protocol. Traction not needed in all cases).**
- **Balloon Inflation: 30-40cc (not accurate measures) depends upon surgeon.**
- **Over traction at BN can cause BN stenosis.**
(Irrigation at our institute continues upto next morning slowly).

❖ 1st void after PUC removal: having clots and tissue bits due to collective clots in prostatic fossa.



❖ **Intra-operative Bleeding in TURP:**

1. Arterial:

- Persistent, Bright red coloured.
- Persist during filling and drainage phase and persist even with irrigation.
- Spurters.
- No practical difficulty in bleeding with various methods.
- Arterial bleeding – touch with coagulation.
- Large artery – difficult to stop.
Compress the tissue around the artery.
Squeeze coagulation.
- Large artery - can do circumferential coagulation around (A)
- Recoil bleeding - Advance sheet upto BN and till it to squeeze vessel and coagulate.

Arterial bleeding easy to control: thick, muscular wall coagulation – spasm.

2. Venous:

- Darker.
- Waxing and waning.
- Disappeared on full bladder.
- More difficult to stop as vein has thin wall. No spasm.



- Vein small low pressure then irrigation so bleeding can happen after removal of sheath.
- So to identify slow down irrigation and coagulate.
- **For profuse venous bleeding – Don't coagulate much inflate balloon and tapenade.**

❖ **Role of Trenexamic Acid:**

- It decrease bleeding / gram tissue of prostate.
- Don't influence number of blood transfusion.
- 2gm TDS on day of surgery and 1st POD.

POST-OPERATIVE BLEEDING

1. Primary Ham'g:

- Hematuria occurs during TURP
- When we can't get clear urine

Cause:

1. **Arterial spurters.**
2. **Residual tissue.**
3. **Bleedings from BN.**
4. **Opening of deep sinus.**
5. **Too thin capsule lobes oozing.**

Management Protocol:

- Locate bleeding site and coagulate.
- Circumferential coagulation of BN.
- Bleeding from sinus: Don't coagulation.
 Inflation balloon & traction.
- Severe uncontrolled bleeding.
- Open immediately and pack into fossa fixed with PUC.
Very rarely needed
- Rule out bleeding disease.
- Supraselective arterial embolization.

2. Reactionary Ham'g:

- In immediate post-operative period mostly due to stoppage of irrigation or release of traction.
- Management by continue irrigation & traction.

3. Secondary Ham'g:

- After discharge of patient after 1 week.
- Mostly due to infection.
- Treated with antibiotics.

❖ **Arterial bleeding increase with pre-operative infection and AUR due to congestion of glands. Finasteride can decrease bleeding from gland.**

❖ **How to coagulate at BN??**

1. Locate bleeding and coagulate.
2. If not then put rectal finger and elevate BN.
3. IF bleeding on anterior wall – suprapubic pressure and coagulate.



COMPLICATIONS

❖ Intra operative:

1. Ham'g

Anterior

Venous

Blood transfusion rate in TURP: 2-4%.
2. Ureteric injury: more with large median lobe.
3. Bladder perforation.
4. TURP syndrome.
5. Persistent penile erection.

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Limits endoscopic movement.
Detumescence spontaneous achieved in most cases.
If not then phenylephrine must given.

❖ Post operative:

1. Post TURP stricture

Causes:

- Iatrogenic trauma
- Infection
- Long surgery
- Long duration of PUC
- 3-4% cases

Location:

- Fossa Navicularis
- Bulbar urethra
- BN
- Pan anterior urethra

❖ How to prevent post operative stricture?

1. Use well lubricated resectoscope with jelly.
2. Pre operative dilatation of narrow urethra with
 - OTIS urethrotome
 - Upto 2-5 FR. More then scope
 - Upto 30 FR.
3. Restrict resection time < 1.5 hour.
4. Pre operative management of infection.
5. Bipolar

2. Secondary Ham'g

3. **BN Stenosis: 0.2% cases**

Due to:

1. Over resection of bladder neck with more fulguration
2. Undermining of trigon may create flap which heals with membrane.

C/F: Initial excellent flow which slowly decreased over time after 3 to 6 minutes

Investigation:

Uroflowmetry
RGU
Cystoscopy



- **Pansadaro grading for BN stenosis:**

Grade-I	Only at BN
Grade-II	Upto mid gland region
Grade-III	Whole gland involved

- **Cystoscopy Grading:**

Mid	22 fr. sheath not passed, only 17 fr. pass
Moderate	Both 17 fr. & 22 fr. not passed
Severe	Pinpoint hole

❖ **Management:**

1. Dilatation: More recurrent
2. Cold knife: 4, 8, 12 o'clock position
3. Colin's knife
4. Laser

❖ **Tip: For small 30cc prostate leave mucosal strip at 12 o'clock to prevent BN contracture.**

4. Retrograde ejaculation

5. Need for Re-TURP: 0.0.5%

6. **Post-operative Retention: 6-8%**

- **Pain / Discomfort**
- **Residual tissue at apex / anterior part**
- **Atonic bladder**
- **Prostatic chips retention**

7. Persistence of urinary storage system: 0.30%

- Mostly due to healing of fossa.
- Associated infection.
- Detrusor instability in long standing BPH.

8. **Incontinence:**

- **Spinster incontinence, Rare 0-2%**
- **Mixed incontinence**
- **Residual adenoma**
- **DO**
- **BN stenosis**

Any incontinence lasting >6 months needs investigation and management.

9. **Sexual Dysfunction after TURP: 4%**

Causes of ED after TRUP:

1. **Electrocoagulation: Corp cavernous nerve injury.**
2. **Thrombosis of artery.**
3. **Venous leak.**
4. **Psychological: Surgery on genitals**

Patient with LUTS avoids sex on its own

Post TURP:

- **Dysuria**
- **Painful erecting avoids sex**

Small gland have more risk for ED

More chances in capsule perforation – more nerve injury.

- ❖ **Retrograde Ejaculation:**
 - History of dry ejaculation with normal sense or orgasm with cloudy post coital urine.
 - All patients must explained about RE before sex.
 - ❖ **ED with LUTS can be early sign of coronary artery disease.**
 - Interval of ED to CAD → 2-3 years
 - **Both have same pathology:**
 - **Endothelial dysfunction**
 - **ED occurs early as affecting small size artery**
 - **CAD after ED can be prevented by life style modification.**
 - ❖ **TURP and Antiplatelet:**
 - Aspirin: Cyclooxygenase Inhibitor
 - Clopidogrol: Adenosine – Disphosphate, pathway inhibitor

High Risk Patients for TURP:

 - Recent / Recurrent ACS
 - Recent PCI < 6 weeks
 - LVEF < 30%
 - Stent > 25mm
 - ❖ **TURP on Aspirin patient:**
 - **TURP at low pressure.**
 - **Spontaneous coagulation must be done.**
 - **Progressive resection.**
 - **Mild traction post operative.**
 - **No staining post operative.**
 - ❖ Aspirin can be continue for TURP
 - Clopidogrol if for primary prevention can stop without risk.
 - ❖ **Risk stratification of urological surgeries:**

Low:

 - SPC
 - TRUS Biopsy
 - BNI

Intermediate:

 - Cystoscopy
 - Stenting
 - URSL with Laser

High:

 - TURP
 - TURBT
 - PCNL
 - ESWL
 - ❖ **Management of Ant platelet:**
- | Category | Low | Intermediate | High |
|--------------------|---------------|------------------------------------|---------------|
| Non urgent surgery | Continue dual | Delay surgery if possible | Delay surgery |
| Urgent surgery | Continue dual | Stop Clopidogrol, Continue Aspirin | Both stop |

❖ TURP

- Patient should be at edge of table
So full range of scope movement can't be hampered
- No need of shaving
- Irrigation fluid at body temperature
- Prostatic chip must be of canoe shape and 29mm length
- Anterior portion resection last:
 1. Less depth – easy perforation
 2. More proximal location of spincter
- **Difficulties for anterior portion resection in:**
 - **Previous orthopedic surgery**
 - **Fixed pelvis**
 - **Trauma patient**
- Why need for irrigation fluid:
 1. For better vision
 2. To overcome minor bleeding
 3. To project chips away from operating field.

❖ Monopolar TURP: Nonionic irrigation

With ionic solution: Dissipation of cutting current poor cutting effect.

❖ Irrigation Fluids:

RL/NS can cause least abnormality when absorbed but can cause dissipation of current.
So can't be used with monopolar TURP.

1. **Distil Water:**
 - Extremely hypotonic
 - Hemolysis
 - Dilutional hyponatremia
 - Renal failure

} Not used
2. **3% Menitol:**
 - No toxicity of glycine, but cause water overload.
 - Costly.
 - Elimination from kidney decrease in patient with chronic renal failure.
3. **Glucose 2.5%:**
 - More tissue charring.
 - Stickiness of gloves.
 - Can cause hyperglycemia.
4. **Urea 1%:**
 - Can cause crystallization of instruments.
5. **Cydal:**
 - Mixture of 2.7% sorbitol + 0.5% menitol.
 - High cost – Non availability.
 - More used in USA.
 - Sorbitol – fragmented into fructose – fructose intolerance.



6. **Glycine: 1.2%, 1.5%, 2.2%**
- 2.2%**
 - 2.2% - Isotonic to plasma
 - ADR of glucine more at this conc.
 - 1.5%**
 - Osmolarity 230 mosm/l c/c to serum osmolarity 290 mlsml/l hypotonic
 - Less hemotoxic
 - Less CVS, RS toxicity
 - Good refractory index
 - 2.2%**
 - More hypotonic

❖ **How to calculate plasma osmolarity:**

$$2 \times S.Na + \frac{\text{Blood Glucose}}{18}$$

TURP SYNDROME

- **Constellation of sign and syndrome secondary to CNS, CVS and electrolyte imbalance resulting from absorption of irrigation fluid during TURP.**
- **Incidence: 0.5 to 0.8%**

❖ **Risk factory for TURP syndrome:**

Patient related:

1. CCF
2. Pre existing hypo Na^+
3. Anticoagulation

Procedure related:

1. Large gland
2. Size > 60gm
3. Time > 90 minutes
4. Capsular perforation
5. Height of irrigation > 60cm

↓

Absorption Rate: = 20ml / min
1 – 1.5 L / hour

300 ml / min fluid ideal for optimum vision

Which attained by 60 cm from pubic height of irrigation fluid

If 70 cm height – double the pressure.

→ **MC Etiopatholgy for TURP syndrome:**

1. Water overload
2. Hyponatremia
 - Dilutional
 - Natriuretic
 - Sequestration
 - Na^+ loss
3. Water toxicity
4. Hypotension
5. Glycine toxicity
 - Toxic to heart & retina
6. Ammonium toxicity
7. Septicemia
8. Coagulopathy
 - Release of prostatic particles rich in thromboplastin leads to DIC



- ❖ Ammonium Toxicity: Visual disturbances
 High ammonia – Suppress Dopamin & NA leads to encephalopathy of TUR syndrome
 - Transient blindness
 - Coloured halo
 - Foggy vision
 - Pupillary reflex lost

- ❖ C/F: Symptoms can present anytime after starting TURP

Spinal Anaesthesia <ul style="list-style-type: none"> • Yawning • Dizziness • N/V Restlessness 	General Anaesthesia <ul style="list-style-type: none"> • Unexplained raised in BP • Bradycardia
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- ❖ Symptoms of Hypo Na⁺

< 125 < 120 < 115 < 110	Asymptomatic N/V, Confusion, Restlessness Bradycardia, Wide QRS Respiratory / CVS arrest, Coma
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HOW TO PREVENT TUR SYNDROME

- ❖ **Pre-Operative:**
 - 1) Pre-existing hypo Na⁺ should corrected
 - 2) Pre-operative antibiotics
 - 3) Overnight hydration of patient
 - 4) Spinal Anaesthesia
 - ↓
 - Awake patient --> early recognition of symptoms
 - Peripheral vasodilation – Help to maintain overload
 - Less blood loss

- ❖ **Intra-Operative:**
 - 1) Irrigation fluid at body temperature
 - 2) Height 60cm
 - 3) Resection time < 90 minutes
 - 4) Avoid capsular perforation
 - 5) Prophylactically furosemide given
 - 6) Low pressure irrigation system
 - 7) Avoid tredlenberg position – it increase fluid absorption rate

- ❖ **How to prevent low pressure irrigation system?**
 - 1) Continuous irrigation Iglesias sheath
 - 2) Intermittent emptying of bladder
 - 3) SPC
 - 4) Suprapubic Router's cannula
 - ↓
 - More than 80cc prostate
 - Improve timing
 - Decrease complications
 - Better resection



❖ **Treatment of TUR Syndrome:**

- As soon as detect TUR syndrome stop resection
 - IV furosemide 1mg/Kg given
 - IV manitol
 - O₂ supplement
 - For pulmonary oedema – 100% pressure ventilation
 - Vital monitoring
 - For Hypokalemia: hypokalemia supplement
 - Blood transfusion if needed
 - Sodium correction: Slowly
- **Sodium deficit:**
(Desired S. Na⁺ (125) - Actual S. Na⁺) x Weight x Volume of body water (60%)
- **Amount of (Na⁺) Fluid needed to correct deficit :-**

$$\frac{\text{Na+ Deficit}}{\text{Conc.in solution}}$$

NS : 154 meq/L

3% NaCl : 513 meq/L

3% NaCl : 1 ml/kg/hour

Not > 100ml / hour

Fast Correction : Pontine demyelination

- **Hyperammonemia : Infusion of L-Arginine 4 gm over 5 minutes**
- **Drainage of peritoneal collection**
- **Management of DIC**

MEDICAL MANAGEMENT

❖ **α Blockers :**

- 40% of prostatic smooth muscle are present in BPH.
- Dynamic component of BPH due to smooth muscle tension.
- α 1A, α 1D is responsible for dynamic component.
- α 1B is epithelium responsible for complications.

❖ **α Blockers :**

- **Non Selective :** **Phenoxibenzemine 10mg BD**
- **α 1 Selective :** **Alfuzocin 10 mg**
Doxazocin 4/8 mg
Terazocin 5/10mg
- **α 1A Selective :** **Tamsulosin 0.4/0.8mg**
Siladocin 4/8mg
Neftodipil 25/75mg

- ❖ **Tamsulosin:** - Decrease 30-40% of IPSS
- Qmax improves 20%



ADR :

- Dizziness
- Asthenia
- Rhinitis
- Abnormal ejaculation : Not retrograde ejaculation due to central hypothesis blocks 5HT₁, D₂, Receptor.
- Peripheral blocks rec. α 1A in SV, VD

Floppy Iris Syndrome :

- More with Tamsulosin
- Intra-operative poor pupil dilation, Iris billowing during ophthalmic procedures

❖ **Alfuzosin:**

- Uroselective alpha blocker not receptor selective.
- Decrease sexual dysfunction low dizziness.

❖ **Siladocin:**

- Safest more useful in old patient / CVS patient.
- Rapid onset of action.
 - More RE.

❖ **5 α R Reductase Inhibitor :**

- Based on embryological development of prostate dependence of DHT
- Development of BPH in androgen dependant
- Patient with S α R (-)nt – Rudimentary prostate

5 α R

Type I : Skin, Liver
Type II : Prostate

Testosterone: -----→ DHT

5 α R

Block → No DHT

Dutasteride 0.5mg → Type I, II Rec

Finasteride 5mg → Type II Rec

5 α R I Improves

- IPSS by 15-30%
- Decrease prostate volume by: 30-40% by 6 months use.
- Decrease S.PSA by 50%.
- Decrease risk of AUR 55%
- Decrease risk of surgery 50 to 55%

5 α R decrease haematuria → by decrease micro vascular density.

❖ **When prostate gland > 40cc and S. PSA is elevated then combine 5 α RI blockers and needed.**

❖ **Phytotherapy:**

- Multiple plant derivatives.
- MOA: Variable, Multiple, Not known.
- Agents :
 - Serena Repens
 - Hypoxis Ruperic
 - Pumkins

❖ **Anticholinergics :**

- Not improves Qmax.
- Increase but not leads to AUR.
- C/I when PVR > 150cc.
- History of AUR.

❖ **PDEI:**

- Increase blood flow to prostatic urethra and increase oxygenation.
- Increase CGMP level – smooth muscle relaxation decrease B.O.O.
- Decrease chronic inflammation
 - No improve in Qmax
 - More effective on storage LUTS
 - IPSS improves by 4-6 points

❖ **Follow up:**

- Medical Management:
 - Review at 1 month
 - Symptomatic improvement
 - ADR of drug
 - IPSS
 - UF, PVR

Then follow up every three months

❖ **Surgery TURP**

- 1st at 10 days – Review HPE
- Rule out early morbidity

Then at 3 months

- Urine Routine & Micro
- IPSS
- UFR
- PVR

Laser for LUTS

- Light amplification by simulated emission of radiation light is generated by simulator emission of radiation by excited laser medium.
- This medium can be gas, glass dye.
- When medium is excited some excited photon are absorbed by medium which increase energy level of laser medium.
→ Excited Phase: when it comes to ground state photons of characteristic wavelength are emitted and struck to other excited ions: Stimulated emission of radiation.

MOA of laser in BPH:

- **Photo thermal effect**
 - Laser absorbed into chromophores
 - Intracellular water / Hb
 - High abs. co efficient → Swallow depth penetration
- **Vaporisation:** Ablation of prostate tissue above boiling point
- **Resection:** Excision into small pieces.
- **Enucleation:** Dissection of adenoma

HO : YAG	Flash lamp medium	Pulsed wave	2100 nm wave length	0.5 mm Penetration	Water Chromo
Thulium	Laser diode medium	Continuous mode	2000 2013 nm	0.2 nm	Water
Nd: YAG ↓	Are lamp diode	Continuous mode	1024 nm	0.8mm	Hb
KTP	Semi conductor		512		Hb
Diode Laser	Semi Conductor		940 980 nm		Water

Laser fiber → Side Firing → Energy from side of fibers for vaporization coagulation

↓
End finding

↓
Energy from tip for resection, enucleation fibres made of con.

- (1) KTP Green Light Laser
512 nm from Nd YAG passed through KTP
Double frequency and half wavelength.

KTP laser moxiFiber tip

Metal Fiber cap to prevent Fiber damage with active cooling system.

PVP: Photoselective vaporization
No touch method sweeping laser Fiber 1-2 mm from prostate tissue
At end point of vaporization active bubbles should form.

Advantage: Office procedure
Anticoagulant
Less dysuria

D. Adv: Cost.
No HPE.

C/C to HELEP
Costly.
Only for BPE, No usable for stones.
Not preferable for large gland
Low learning curve
More regrowth of adenoma
Cost of Fiber is high
Cost of laser machine is high

(2) Thulium:

For ablation and resection of BPE

THUVAR: Thulium vaporization of prostate

THUVARP: Thulium vaporessection of prostate

THUVEP: Vapoenucleation of prostate



THULEP: Enucleation of prostate

Adv: Smooth cutting C/C to HOLEP
Minimum collateral damage
For any size of prostate
Less blood loss
Stone can be managed

D.Adv: More learning curve
Costly

(3) **HO YAG:** Pulsed Laser
0.4mm depth penetration

Enucleation in plane where in Frayer fingers moves.
Adenoma separated out and send back to bladder and morcellisation done.
Two lobe method
Three lobe method

- ❖ Methods to remove adenoma:
- Morcellisation
 - Mashroom method → Adenoma attached to thin stalk and resected it out.

Problem in HOLEP:

- Poor vision C/C to TURP
- Too deep / superficial plane
- Difference in defining apex
- Not cutting in proper plane.

Open Prostatectomy

Indications:

- All indications of TURP
- > 75 g.
- *If sizable bladder diverticula justify removal, suprapubic prostatectomy and diverticulectomy should be performed concurrently.*
- Large bladder calculi that are not amenable to easy transurethral fragmentation may also be removed during the open procedure.
- Ankylosis of the hip or other orthopedic conditions, preventing proper positioning for transurethral resection.
- Recurrent or complex urethral conditions, such as urethral stricture or previous hypospadias repair, to avoid the urethral trauma associated with transurethral resection.
- Inguinal hernia with an enlarged prostate suggests an open procedure, as the hernia may be repaired through the same lower abdominal incision

Contraindications:

- Small fibrous gland,
- Presence of prostate cancer,
- Previous prostatectomy or pelvic surgery

Anesthesia: Regional

Retropubic Prostatectomy:

Position:

supine position with mild Trendelenburg position without extension of table

Technique:

- A No. 22 Fr urethral catheter with a 30-mL balloon is passed into the bladder and connected to a sterile closed-drainage system and the balloon is inflated with 30 mL of saline.
- A lower midline incision from the umbilicus to the pubic symphysis is made.
- **The transversalis fascia is incised sharply to expose the space of Retzius**
- The peritoneum is mobilized cephalad starting at the pubic symphysis and swept anterolaterally.
- A self-retaining Balfour retractor is placed in the incision and widened. A well-padded, malleable blade is connected to the retractor and used to displace the bladder posteriorly and superiorly.
- Balloon is allowed to rest at the level of the bladder neck and aids in identifying the prostatovesical junction later in the operation.
- The anterior surfaces of the bladder and prostate are exposed.
- Using DeBakey forceps and Metzenbaum scissors, the preprostatic adipose tissue is gently removed to expose the superficial branch of the dorsal vein complex and the puboprostatic ligaments (Fig. 89-1).
- **Before proceeding with enucleation of the prostatic adenoma, it is important to achieve complete control of the dorsal vein complex as well as the lateral pedicles at the bladder neck (the main arterial blood supply to the prostate gland)**
- The endopelvic fascia is incised laterally and the puboprostatic ligaments are partially transected, similar to the maneuver in an anatomic radical retropubic prostatectomy (Reiner and Walsh, 1979).
- A 3-0 monocril suture on a 5/8 circle-tapered needle is passed in the avascular plane between the urethra and the dorsal vein complex at the apex of the prostate and tied (Fig. 89-2A). The superficial branch of the dorsal vein at the bladder should be coagulated or ligated
- The 30-mL balloon of the catheter is used to identify the junction between the bladder and the prostate. The balloon is then deflated and a chromic suture on a large CTX needle is used to place a figure-of-eight stitch deep into the prostatovesical junction at the level where the seminal vesicles approach the prostate gland bilaterally (Fig. 89-2B). With this maneuver, the main arterial blood supply to the prostate adenoma is controlled.
- **With a sponge stick on the bladder neck to depress the bladder posteriorly, a No. 15 blade on a long handle is used to make a transverse capsulotomy in the prostate approximately 1.5 to 2.0 cm distal to the bladder neck**
- The incision is deepened to the level of the adenoma and extended sufficiently laterally in each direction to permit complete enucleation.
- A pair of Metzenbaum scissors is used to dissect the overlying prostatic capsule from the underlying prostatic adenoma.
- Once a well-defined plane is sufficiently developed, the index finger can be inserted between the prostatic adenoma and the capsule to develop the plane further laterally and posteriorly (Fig. 89-4).
- A pair of Metzenbaum scissors is then used to incise the anterior commissure from the bladder neck to the apex, separating the lateral lobes of the prostate anteriorly.
- The posterior prostatic urethra is exposed and the index finger is inserted down to the verumontanum.

- The mucosa of the urethra overlying the left lateral lobe is divided sharply at the level of the apex under direct vision without injury to the external urinary sphincter. With the aid of a Babcock clamp, the left lateral lobe is removed safely.
- This maneuver is then repeated for the right lateral lobe.
- If a median lobe is present, the overlying mucosa is incised at the level of the bladder neck, and this lobe is removed (Fig. 89-5). In this manner, the entire prostatic adenoma is removed with preservation of a strip of posterior prostatic urethra.
- **Because the capsulotomy is a transverse rather than longitudinal incision, there is little risk that the incision will be inadvertently extended into the sphincteric mechanism during the enucleation process, which would compromise subsequent urinary continence.**
- The prostatic fossa is now carefully inspected to ensure that all of the adenoma has been removed and that hemostasis is complete.
- **If hemorrhage is persistent, a 4-0 chromic suture can be used to place a figure-of-eight stitch in the bladder neck at the 5 and 7 o'clock positions. When placing these stitches, it is necessary to visualize the ureteral orifices so that they are not incorporated into the stitches.**
- If the bladder neck appears obstructive at the completion of the operation, it may be appropriate to perform a wedge resection at the 6 o'clock position and advance the bladder mucosa into the prostatic fossa. This maneuver helps prevent the development of a bladder neck contracture.
- After inspecting the bladder for a complete adenoma removal and hemostasis, a No. 22 Fr, three-way Foley catheter with a 30-mL balloon is inserted through the anterior urethra and prostatic fossa into the bladder.
- With the urethral catheter in place, the prostatic capsule is closed (Fig. 89-6). A 2-0 chromic suture on a 5/8 circle-tapered needle is used to create two running stitches. These stitches begin laterally and meet in the midline; they are first tied separately and then together to create a watertight closure.
- The bladder is then irrigated with saline to ensure continued hemostasis and to test the capsular closure for leakage.
- A small, closed-suction drain is placed through a separate stab incision lateral to the prostate and bladder on one side to prevent hematoma and urinoma formation. The pelvis is irrigated with copious amounts of normal saline solution
- Wound closed in layers

Suprapubic Prostatectomy:

Position : Same

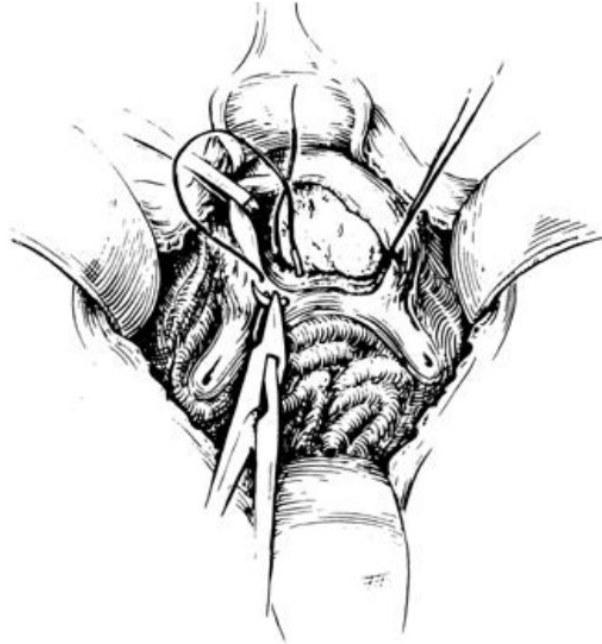
Technique:

- **No. 22 Fr catheter is inserted into the bladder. After residual urine is drained, 250 mL of saline is instilled into the bladder and the catheter is clamped.**
- A lower midline incision is made from the umbilicus to the pubic symphysis (Fig. 89-7).
- The anterior bladder wall is identified, and two 3-0 Vicryl stitches are placed on each side of the midline below the peritoneal reflection.
- **A vertical cystotomy is made with an electrocautery. Using a pair of Metzenbaum scissors, a cystotomy is then extended cephalad and caudally to within 1 cm of the bladder neck (Fig. 89-8).**
- Several pairs of stay stitches are placed using 3-0 Vicryl sutures on each side of the midline to facilitate exposure.
- **A figure-of-eight stitch using a 3-0 Vicryl suture is placed and tied at the most caudal position of the cystotomy to prevent further extension of the cystotomy incision during blunt finger dissection of the adenoma.**
- After inspecting the bladder, a well-padded, malleable blade is placed in the bladder, connected to the Balfour retractor, and used to retract the bladder cephalad. The bladder neck and prostate gland can now be visualized.
- A narrow Deaver retractor can be placed over the bladder neck and used to expose the trigone further.
- **An electrocautery is used to create a circular incision in the bladder mucosa distal to the trigone (see Fig. 89-8).**
- Care is taken not to injure the ureteral orifices.
- Using a pair of Metzenbaum scissors, the plane between the prostatic adenoma and prostatic capsule is developed at the 6 o'clock position (Fig. 89-9).
- Once a well-established plane is created posteriorly, the prostatic adenoma is dissected circumferentially and inferiorly toward the apex, using blunt dissection (Fig. 89-10).
- At the apex, the prostatic urethra is transected using a pinch action of two fingertips, avoiding excessive traction so as not to avulse the urethra and injure the sphincteric mechanism. At this point the prostatic adenoma, as either one unit or separate lobes, can be removed from the prostatic fossa.
- Closure of UB in 2 layers and keeping SPC
- Drain and close the wound

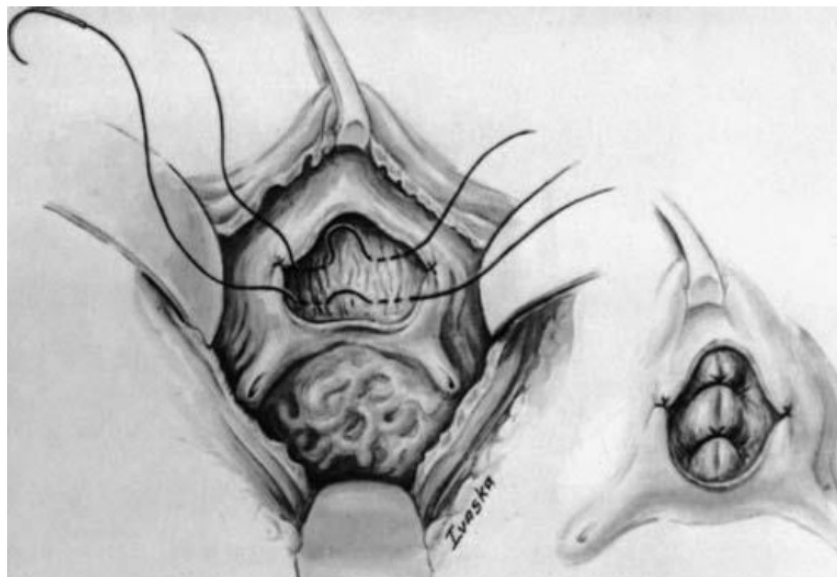
Q. Which are the hemostatic manoeuvres after open prostatectomy?

Hemostatic maneuvers after open prostatectomy:

- Remove residual adenoma
- Electrocautery of bleeding points
- 2 figure of 8 stitches at 5 and 7 o'clock at prostatovesical junction (Halsted sutures)



- Packing of the prostatic fossa.
- Malament suture: purse string suture at the vesical neck by nylon and ends brought out from the skin and traction for 2 – 3 days.
- O'Connor suture: transversely placed placating sutures in the posterior prostatic capsule.



CHAPTER

3

Neurogenic Bladder

- ❖ Formation of spinal cord begins by **18th Day after conception**.
Closure of canal proceeds in craniocaudal direction and completed by **35th day**.

Vertebral Column	Spinal Cord level
Lower Cervical	+1
T ₁ – T ₆	+2
T ₆ – T ₉	+3
T ₁₀	L1 – L2
T ₁₁	L3 – L4
T ₁₂	L5
L ₁	sacral+ coccygeal

Spinal cord terminates at L1.
Corda equina: L2

Spinal cord tappers and ends at L1-L2 level

Most distal bulbar part called as **conus medullarias**.

Tapping end containing fibrous non neural extension of cord known as **filum terminalis**.

Distal to this nerve roots which are like tail of horse – **cauda equina**.

- ❖ **Voiding Physiology:**

Normal Voiding: Spinal reflux which is modulated by central nervous system.

- ❖ **Brain:**

Micturation centre located in frontal lobe.

Primary function is to send tonically inhibiting signals to detrusor which prevents emptying until social accepted time and location.

- ❖ **Pons:**

Primary relay station between brain and bladder.

Pontine micturation centre

Sensation from bladder -> Pons

Inherited excited nature

Switch to voiding pathway.

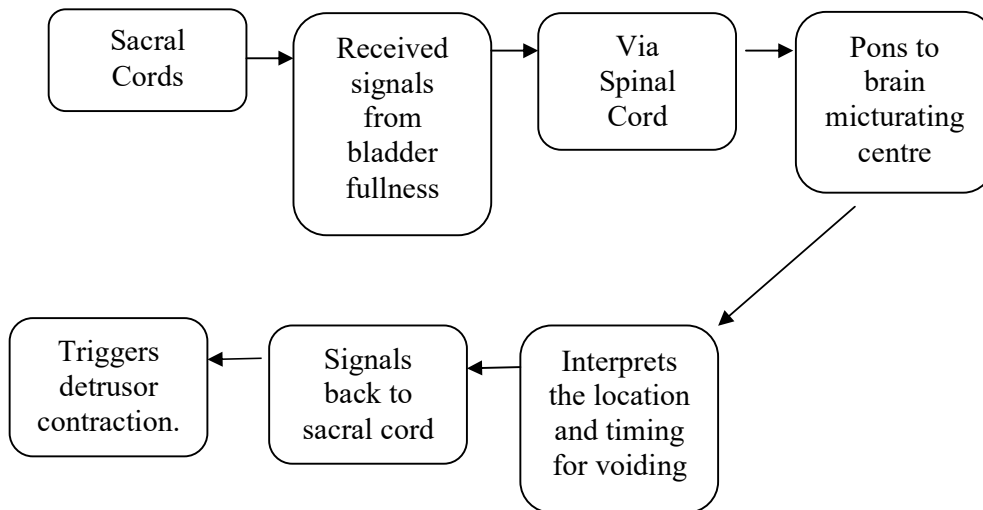
PMC is under control of emotions and fear.

Brain centres takes over after 3-4 year.

This is the age of toilet training.



❖ **Spinal Cord: Communicating pathway**



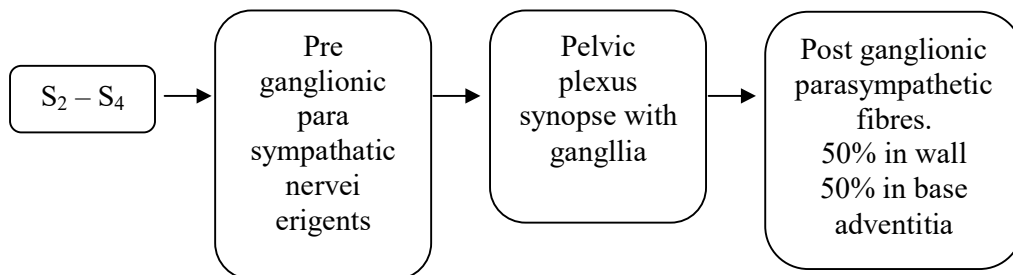
Sacral Reflex Centre:

- **Primary voiding centre**

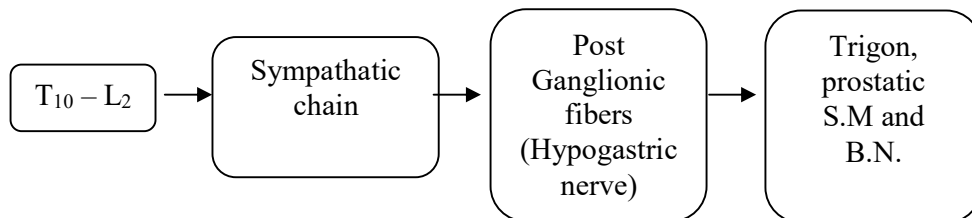
❖ **Peripheral Nerves:**

Symptomatic: Nerves of fillings
Para symptomatic: Nerves of emptying.

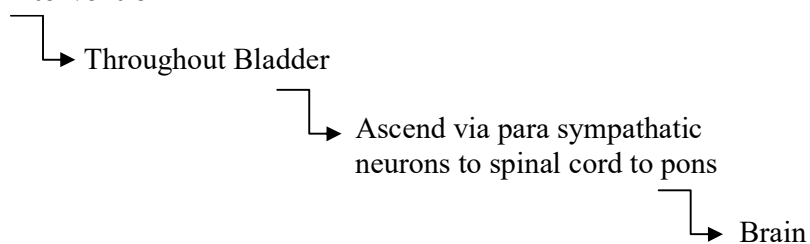
Parasympathetic:



Sympathetic:



Afferent Intervention:



❖ **Compliance:**

Compliance of bladder depends upon viscoelastic property of bladder.

Attributed by:

- Smooth muscle
- Collagen
- Elastin

Compliance: Changes in bladder volume in relation to change in bladder pressure.

$\Delta V / \Delta P$ mL/cm h₂O

There is no normal range of compliance.

Fallacies in compliance:

1. Fast filling of bladder
Increase problem of accommodation.
2. VUR: Leads to transmission of fluid into reflux. Pop off michenism.
3. Diverticulum

Compliances depends on:

1. **Composition of bladder wall**
2. **Geometry of bladder**
3. **Active property of S.M.**
4. **Nervous system has some role.**

So changes in compliances mostly due to:

1. **Altered bladder composition**
2. **Fast filling rate**
3. **Altered SM property**
4. **Combination of all**

❖ **DLPP: Detrusor leak point pressure**

Imp element for poor compliance patient.

DLPP: lowest p_{det} at which urine start leaking without detrussor contraction OR raised in p_{det}.

In poor compliance patient:

- decrease urethral resistance and decrease DLPP
- Incontinence good prognosis

Upper tract will be preserved

But if DLPP is high – Brunt of attack taken by upper tract.

If DLPP > 40, than 90% chances of UT damage.

DLPP is the injured bladder response to outlet resistance.

❖ **UDM risk factors in neurogenic bladder:**

1. **Impaired compliance**
2. **Poor emptying with high storage pressure**
3. **DESD**
4. **Smooth muscle dysnergia.**
5. **Increase DLPP**
6. **High pressure overactivity.**

❖ **Diabetic Cystopathy:**

CRI - FRIDMONT coin the term for
Characteristic UDM finding of –

- **decrease sensation of bladder**
- **High PVR**
- **Poor contractility in patient with DM.**

No relation with age or sex

Related with duration of DM

❖ **Pathogenesis:**

1. Neuronal: Autonomic neuropathy
Metabolic byproducts leads to nerve damage
2. Myogenic: Altered smooth muscle composition
Increase collagen deposition.
3. Osmotic diuresis:
Increase volume - distension
Increase intra vesical pressure
Disease progression
 - Decompression
 - Acontractility

❖ **UDM Findings:**

- **Poor sensation**
- **Properception**
- **Overactivity – 33%**
- **Compliance – Normal**
- **Capacity – Large**
- **With acontractile detrusor**

DM in Urology:

1. Diabetic Cystopathy
2. Diabetic Nephropathy
3. Papillary Necrosis
4. Increase risk of UTI
 - Abscess
 - Pyelonephritis
 - EPN
5. ED
6. Hypogonadism
 - Low SHBG
7. BPH
 - Increase prostate size
 - Hyperinsulinemia
 - Increase sympathetic system activity
 - Increase dynamic component
8. Urinary incontinence – Female high risk for UUI, SUI.
9. Stone – High risk for uric acid stone.
10. Surgery related complications.

❖ **Classification of Neurogenic Bladder:**

1. **UDM Classification –**

- Detrusor hyperreflexia
 - Co-ordinated sphincters
 - DESD
 - Smooth muscle dysenergia
 - Non relaxing sphincters
- Detrusor Areflexia –
 - Co-ordinated sphincters
 - Non relaxing striated sphincters
 - Non relaxing smooth sphincters
 - Denervated sphincters

Disadvantages:

- Doesn't include all conditions.
- No mention on compliance and sensation.

2. **Bor's cremer classification**

3. **Loop classification**

4. **Functional classification**

5. **International continent society classification**

6. **Lapide's classification**

❖ **Lepide's Classification:**

1. **Sensory neurogenic Bladder:**

Injury to sensory afferent from bladder to SC to brain.

No sensation of bladder filling.

Unless voluntary voiding initiated – Over distended bladder.

2. **Motor Neurogenic Bladder:**

Para sympathetic damage

Acontractile detrusor

3. **Unihibited Bladder:**

Loss of conicomedullary inhibition

Primitive sacral cord reflux

Overactivity with low volume

Increase frequency and urgency

4. **Reflux Bladder:**

Injury between sacral SC to brain

No sensation

Incontinence without sensation due to low volume contraction from S.C

5. **Autonomus:**

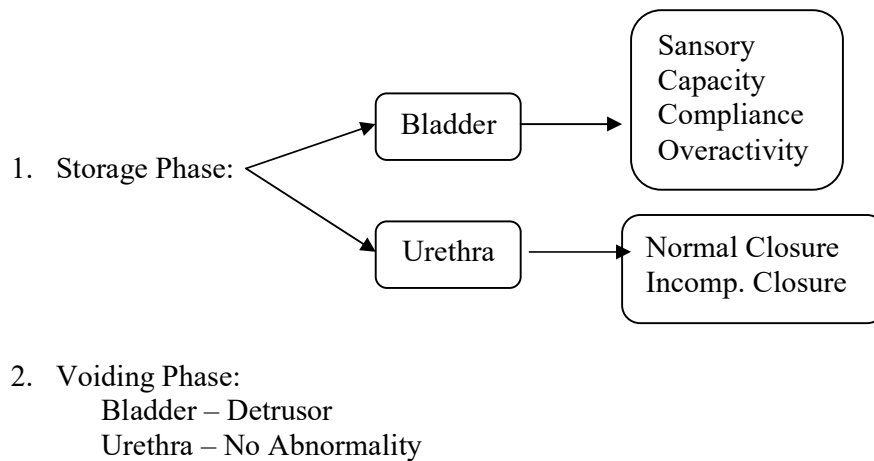
Injury bladder to Spinal cord

Inability to initiate voluntary micturation

No sensation

Comp. motor / sensation loss

❖ **International Continent Society Classification:**



Occult Spina Bifida

Condition defined as congenital defect affecting formation of spinal column but not resulting in open vertebra

DID:

- Ant. Sacrum maningocele
- Laptomangocele
- Intradural lipoma
- Tight filum terminale
- Cauda equina tumor

90% of these patients have tufts of hair

- Skin growth
- Small dimple
- Subcut lipoma
- Asymmetrical gluteal cleft.

May have:

- High arched foot
- Clubbed foot
- Asymmetrical length of L/L
- Back pain

Fecal soiling

Difficulties in toilet training

Recurrent UTI.

Infants:

Having normal neurogenic examination.

Abnormal UDM 1/3 patients

Mostly UMN

Child > 3 years:

90% patients have abnormal neurology

No predisposing to any type of lesion. 60% have progressive lesion



❖ Response rate to management:

Infant: 30% improved
60% revert to normal
10% Worse

Toddler: 27% stable
27% impaired
27% remain normal.
Rest - worse

Investigations:

- Routine investigation
- USG spine < 3 months – Screening
- MRI Spine
- Pre-op, Post-op UDS

Treatment:

- Good results of surgery if done by 1 year of age.
 - Delays surgery: Worst result
 - Mostly laminectomy and removal of intra spinal pathology.
- No need to evaluate young asymptomatic patient with occult spine bifida.

❖ Why occult spine bifida cause pathology?

- Compression on cauda equina by pathology
- Tension on spinal cord from tethering secondary to different growth.
- Fixation of split lambo-sacral cord by intravertabral body spicules.

❖ Cauda equina syndrome:

Neuromuscular and urological symptoms resulting from compression of multiple lumbosacral nerve roots below conus medullaris.

- sensory to saddle area
- Motor to sphincter
- Para symptomatic to bowel / bladder.

Cause of C/E syndrome:

- Lumbar stenosis
- Spinal tumor
- metastasis
- Prolapse disc (L4-L5 90%)
- Tethered cord

90% patients have chronic back pain

Unilateral / Bilateral sciatica

Perineal hypoesthesia

L/L motor weakness

Under reflux

❖ DID between conus medullaris syndrome & cauda equine syndrome:

Conus Medullaris	Cauda Equina Syndrome
- Sudden onset bilateral	- Unilateral onset
- Knee jerk normal	- Both affected
- Ankle jerk affected	
- Less radicular pain	- More severe pain
- more back pain	- Less chronic back pain
- Overflow incontinence more	- AUR more common
- Less severe symptoms	- Severe symptoms
- Normal motor function	- Weakness to flaccid paralysis
- Poor outcomes	- Good outcome
- Involvement L ₁ -L ₂ level	- L ₂ sacrum involvement

❖ **Tethered Cord Syndrome:**

Stretch induced function disorder of spinal cord when it is anchored by inelastic structures which, restricts the movements of spinal cord.

- Fibrosis filum terminale
- Scar of previous surgery
- Bony spicules

Symptoms:

- Back pain
- Weakness of leg
- Foot deformities
- Sensation loss

Dysfunction classified only on UDM

Presenting symptomatology may altered by stretch induced due to sports and cycling.

❖ **Why it is presenting in adult age?**

- Increase physical activity
- Increase fibrosis of filum leading to progressive loss of viscoelasticity of cord
- Growth spurt causing rapid spinal cord fusion
- Development of spinal stenosis

❖ **Sensory Distribution:**

- L₁ Inguinal
- L₂ Upper thigh
- L₃ Lower thigh knee
- L₄ Medial leg
- L₅ Dorsum foot
- S₁-S₂ Lateral foot
- S₃-S₄ Saddle

❖ **Cremasteric Reflux:**

- Light stroking of supra medial thigh
- Normal response: contraction of cremaster muscles that Pulls up testis.
- AFF: Ilioinguinal nerve
- EFF: Genital branch of genitofemoral nerve
- Center: L₁, L₂

Absent in L₁, L₂ cord injury
Torsion testis

❖ **Bulbo Cavernous Reflux:**

Monitor anal sphincter contraction in response to glans / clitoris squeezing.

If PUC → tugging of PUC

Center: S₂ to S₄

1st to recover after spinal shock

❖ **Perineal Reflux: (anal wink)**

Contraction of ext. anal sphincters on sticking skin around anus

S₂-S₄

CIC

(Clean intermittent catheterization)

Proposed by **Lapides:**

Aim:

- To improve continence
- To preserve upper tract
- To decrease UTI

Rationale:

When bladder is over distended having decrease blood supply and more prone to infection.

While chances of infection from vaginal / urinary flora in intact blood supplied bladder is less.

Indication:

- Neurogenic bladder
- Acontractile detrusor
- Bladder reconstruction

No role of antibiotics along with CIC.

❖ **How to decide timing of CIC?**

- For 24 hour output
- Leak period at what time
- Look for DLPP at which amount DLPP is achieved.

❖ **In patient with CIC always ask for –**

1. Frequency of CIC
2. How much urine drained
3. Night wetting
4. How much leak between CIC
5. Time of leak between CIC
6. Since how long leak started

} All points must be asked

- Along with ambulatory status
- Previous LUTS
- OR
- LUTS after surgery
- Recurrent changes in symptoms
- Recent onset fever



❖ **How to do CIC?**

- Normal capacity of bladder 400-500cc
Never allow bladder to drain > 400cc
So daily 4-5 times
Every 6 hourly
Before sleeping and after wake up
- With washing hand with soap.
- No need for antimicrobial agents.
- Use 14/16 fr. CIC catheter.
- Apply jelly and introduced CIC catheter until all urine drained.
- After that removed it and washed with tap water.
- Keep catheter in zip log back.
- Single catheter can be used for 1 week to 2 weeks.

UTI in SCI

❖ **UTI in SCIU MC cause of fever:**

Cause of UTI:

1. High bladder pressure
2. Incomplete voiding
3. Stone
4. Impaired defense mechanism
5. Catheterization

Mostly Asymptomatic

When to suspect OR danger signs:

1. Cloudy OR foul smelling urine
2. Malaise
3. Unexplained fever
4. Increase incontinence
5. Flank Pain

Treatment:

1. Always do urine culture and sensitivity
2. Treatment according to culture
3. High chances of bacterial resistance
Diverse flora most common
So always treat as per culture report.
E.Coli is the most common organism.

Afebrile patient: Oral fluoroquinolones

Spinal injury with UTI and fever: IV antibiotics as per culture atleast 5 days

No role of prophylactic antibiotics.

No role of treatment of asymptomatic bacteriuria.

In case of recurrent UTI:

1. Rule out underlying change in bladder pathology
2. To rule out stone if any
- 3.

SPC delays development of bacteriuria in SCI

CIC least UTI c/c to SPC & PUC

UTI in SC injury patient:

Should be no organism in S.P. aspiration –
 $<10^2$ in int. catheterization
 $<10^4$ in mid stream urine

❖ PUC vs SPC in SCI patient?

SPC Advantage:

- Decrease urinary damage.
- Decrease bladder spasm.
- More sanity.
- Minimum infection.
- Better sexual satisfaction.

D.Adv:

- More trauma.
- Colon injury chances more.
- Skin cellulites
- Stones

PUC disadvantages:

- Infection more
- Encrustation
- Mon struvite stone
- SCC of bladder
- Repeated blockage of PUC
- Cripling urethra
 - Pressure necrosis on ventral surface of urethra and meatus.
 - Acquired hypospadias

In female patient urethra: pressure necrosis of BN

Indication of repeat UDM in SCI:

- **Recurrent UTI**
- **Increase leakage between CIC**
- **Overflow incontinence**
- **HUN in USG**

If in absent of all above wait for 3-4 weeks to do UDM after SCI

If no HUN and intermittent leak on UDM: S/o. low capacity good compliant bladder.
If HUN without leak: Poor compliant bladder may small capacity, high DLPP can be there.
HUN with leak: poor storage pressure, poor compliance with small capacity.

DESD: Detrusor Spincter Dysengia

Kinesiological dissociation of two group of muscle that are works in harmony.

Involuntary contraction OR lack of relaxation of either striated OR smooth muscle.

DESD can occur only in SCI above supra-sacrum level.

T₆ and above: Smooth muscle dysergia

Causes of DESD:

- SCI
- Tethered cord syndrome
- Transverse myelitis
- Neurodysraphism

Blaivas Classification:

- | | |
|---|---|
| Type I | Concomitant increase in pdet with EMG
But at pdet Qmax spontaneous relaxation of spinctures
Incomplete lesion |
| Type II | Sporadic spincter contraction throughout voiding |
| Type III | Crescendo – decrescendo pattern |
| Type II-III is seen in complete lesion. | |

Complications:

1. VUR
 - Detrusor contraction against closed spinctures
 - High UT damage
2. Renal Failure
3. Urolithiasis
4. Urosepsis

Investigation:

1. Routine investigation
2. MCUG
3. Video UDSwith EMG

Management options:

1. CIC with anticholinergics
2. Per urethral catheterization
3. Intra spinctures Botox 3,9,12, 6 position
 - Not permanent solution
4. Stent:
 - Urolyme OR Mamocath
 - Extend caudal half of veru to 5mm in bladder
 - Post operative X-ray pelvis is needed.
5. Spinctrectomy:
 - With 24 fr. resectoscope and colin's knife
 - 12 o'clock position from proximal varu to proximal bulbar urethra
 - Cut spincter muscle fibers
 - Put PUC for 1 week
 - After surgery do UDM if DLPP > 40cm suggestive failure of surgery
 - Do re-do surgery
6. Urinary Diversion

❖ UDS pattern on DESD:

1. Saw tooth appearance on pdet.
2. Simultaneously incoordinated activity of EMG
3. Hold of contrast at spincter in VUDS.

Dysfunction Voiding:

When dysergia present without neurological lesion then it is considered to be learned behavior and known as dysfunction voiding.

Dysfunction voiding:

Failure to relax OR contraction of sphincter during voiding phase
Mostly in children. Very rare in adult.

Criteria:

- **No neurological lesion**
- **High EMG sphincter activity with no pabd.**
- **Transient and intermittent closure of ext. sphincter during EMG.**

❖ Primary Bladder Neck Obstruction:

- Incomplete opening of BN during voluntary OR involuntary voiding.
- If in neurogenic patient: known as **smooth muscle DESD**
- Non neurogenic patient:
 - Bladder neck obstruction
 - Bladder neck dysfunction

Etiology:

Abnormal arrangement of muscle fibers which leads to closure of bladder neck instead of funneling while bladder neck contracts

C/F:

Obstructive LUTS
Recurrent UTI

Type I	High pressure low flow
Type II	Low flow normal pressure
Type III	delayed bladder neck opening

In V. UDS non funneling of bladder neck is diagnostic.

NEURAL TUBE DEFECTS

❖ Causes of Neuromuscular Dysfunction:

1. Congenital:
 - NTD
 - Spine bifida occulta
 - Sacral agenesis
2. Acquired:
 - Ext. pelvic surgery
 - Spinal cord injury
 - CNS injury
 - Palsy
 - Tumor
 - Infarct

❖ M.C. location for maningemylomere:

Lumbosacral	>	Lumber	>	Sacral
47 %		27 %		20%

Maningocele:	Maninges extend beyond column.
Maningomyelocele:	Nerve root / SC evaginates with maningis.
Lipomangocele:	Fatty tissue with cord evaginates

Antenatal MMC: Detects by 16-18 weeks
Maternal SAFP amniotic AFP increase
USG suggestive of progressive insult with decrease L/L movements

Antenatal surgery improves neuromotor function but no improvement in bowel / bladder functions. Increase risk of pre-term labour.

❖ **Prevention of NTD:**

- Folic acid supplements
- Food fortification with FA

Dose:

- **No F/H of NTD: 0.4mg/month prior pregnancy**
- **F/H of NTD: 4mg FA x 2 months prior pregnancy**

❖ **Postnatal MMC:**

- Immediate surgery after birth
- Handle with care

Investigation after surgery for MMC:

1. USG KUB with PVR
15cc capacity of bladder at birth
< 5cc PVR acceptable
 2. RFT
 3. Urine culture & sensitivity
 4. VCUG
 5. UDM
 6. DMSA Scan
- } 6 weeks

❖ **LUTS dynamics of MMC patient:**

On UDM

- | | |
|---------------|-----|
| • Synergic | 26% |
| • DESD | 37% |
| • Denervation | 36% |

❖ **Management goal for MMC:**

1. **Preservation of RFT**
2. **Preservation of UTI**
3. **Preservation of continence**
4. **Sexual function preservation**

❖ **Concept of early intervention in MMC:**

Early intervention means: CIC, anticholinergics



Adv. of CIC:

1. Decrease UTI
2. Decrease incontinence
3. Decrease upper tract deterioration
4. Decrease need of surgery
5. Increase compliance of bladder

❖ When to change anticholinergic in MMC patient?

- If it is dynamic disease process as in c/o tethered cord syndrome.
- Syringomyelia.

❖ Dose of

Tolterodine:	0.01mg/kg BD
Oxybutinine	0.2mg/kg

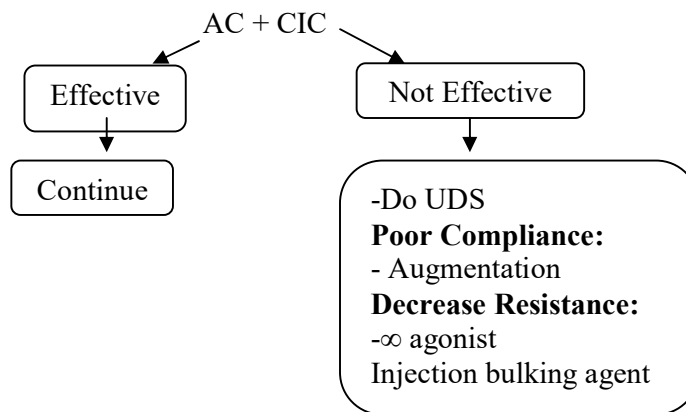
❖ For VUR management in MMC patients.

- Low Grade: Antibiotic prophylaxis
- High Grade: Anticholinergic & CIC
Augmentation cystoplasty if, needed.

❖ Management for constipation with laxatives

❖ Continence Management:

- Initially with



❖ Sexually function:

- 70% patient can have erection.
- 2/3 can ejaculate.

PDE5I can be given.

ICIVAD is also effective.

Female is at high risk for pregnancy.

❖ Monitoring Protocols:

1. **Newborn to toddler:**
USG 6 monthly upto 2 years
UDS yearly
DMSA when indicated
2. **Toddler to Adolescent:**
USG yearly
UDS/DMSA: change in L/L ambulation
3. **Adult:**
USG yearly
UDS:
 - **Recurrent UTI**
 - **HUN**
 - **Increase need for CIC**
 - **Night wetting**

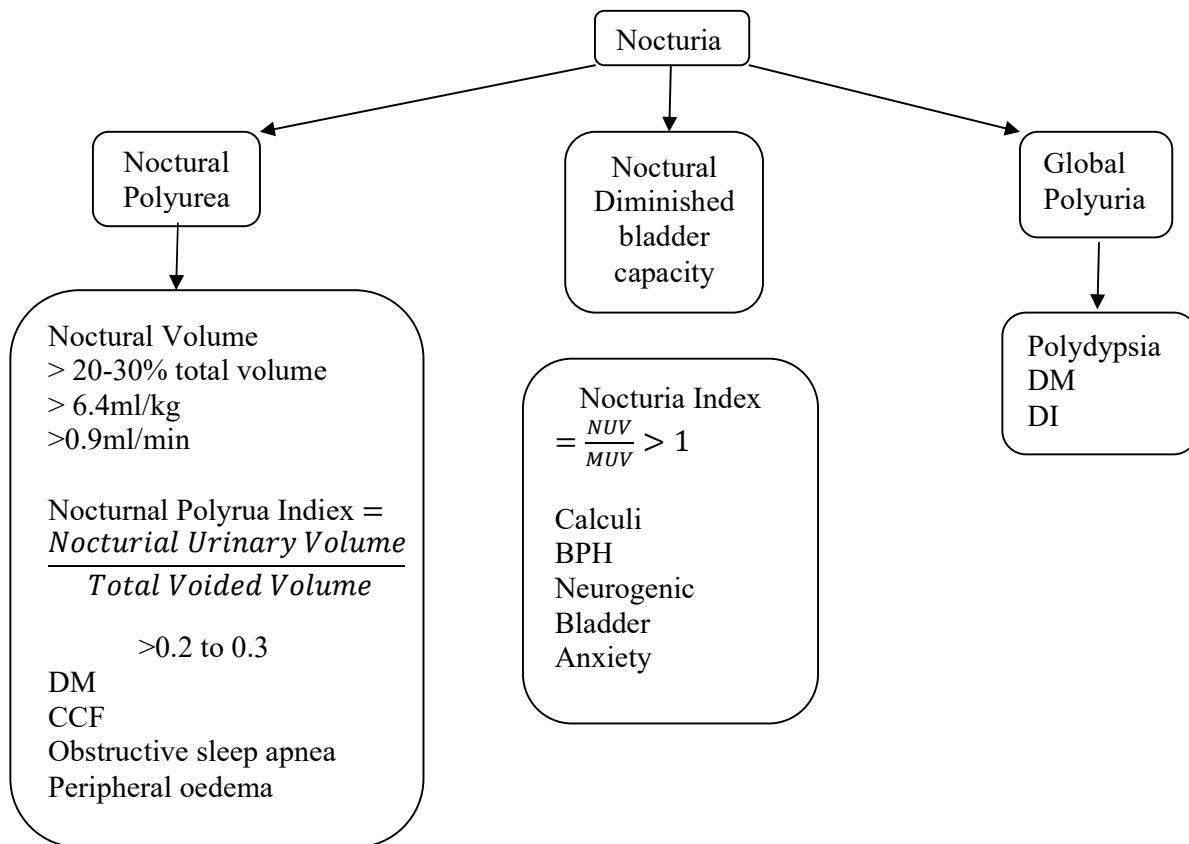


SACRAL AGENESIS

- ❖ Absent of part or all for ≥ 2 lower vertebra
- Having normal anal sensation
- L/L normal
- Urologically: 35% UMN
40% LMN
Rest has no lesion.
- Lesion are stable not progressive

NOCTURIA

Voiding one or more time during period of sleep and each voiding proceeded and followed by sleep



- ❖ **Nocturia in BPH:**
 - Increase PVR
 - Decrease functional capacity of bladder leads to nocturia
 - Improves with TURP

- ❖ **Spinal Cord Injury:**

1. **Suprapontine Lesion:**

- Predominant storage symptoms
- Overactive bladder
- Insignificant PVR

2. **Infrapontine – Suprasacral Lesion:**



- Voiding + storage LUTS
- Overactivity + DESD
- Raised PVR

3. Sacral – Infrasacral:

- Predominant voiding symptoms
- Increase PVR
- Acont. Detrusor

❖ Spinal Injury Stages:

1. Spinal shock (Stage of flaccidity)
 - Limb flaccid paralysis
 - Retention, constipation
 - All sensation lost
2. Reflux Activity:
 - Recovery stage (3 – 6 weeks)
 - Smooth muscle → tone → skeletal muscle
 - Flexor reflex first to recover
3. Reflux Failure:
 - Halting of recovery
 - Wasting

❖ Autonomic Dysreflexia:

Acute massive disordered autonomic response to special stimuli in patient with spinal cord injury above T₆₋₈

Autonomic hyperreflexia: Increase sympathetic activity in response to stimuli below level of lesion.

Resulting in headach

- Hypertension
- Flushing
- Arythmia

Precipitated by:

- Bladder / rectal distension
- LUT instrument
- PUC obstruction

- Afferent pathway from nociceptors ascend to cord but can't inhibited by medulla causing severe sympathetic stimulation.

- How to minimize it?

- Not allow bladder to over distended.
- During PUC change proper lignocaine.
- A.C. to quite bladder.

- Management:

- Manage with β blockers
- Sublingual nifedipine can abolished symptoms
- No consensus for ideal management

❖ Aim of any treatment in Neurogenic Bladder:

1. Protect upper tract
2. Achieve continence
3. Increase QoL

- ❖ Management option for **failure of empty**:
 1. CIC
 2. No role of bethanochole
 3. Bladder muscle augmentation (Detrusor hypoplasty)
 4. Sacral neuromodulation
- ❖ Management option for **failure to store**:
 1. Anticholinergics
 2. β 3 agonist
 3. *Botox*
 4. S.N. modulation
 5. Sacral rhizotomy
- ❖ Management option for **high storage pressure, poor compliance**:
 1. A.C. with CIC
 2. Auto-Augmentation
 3. Urinary Diversion
- ❖ CV Stroke:

After 24 hours of stroke, 4% patients have retention due to cerebral shock.

After that patient have –

 - Nocturia
 - D. Overactivity
 - Urge incontinence

70-80% of patients recovers by 6 months.
- ❖ Tumor:
 - Frontal lobe mostly have incontinence
- ❖ Parkinson's Disease:
 - Detrusor overactivity and striatal spincture bradykinesia.
 - Pseudo DESD
 - TURP is not C/I in PD but before surgery UDS is must.
- ❖ Lumbar Disc Prolapse:
 - Slow progressive herniation of disc
 - Irritation of sacral nerves – Hyperactivity
 - Acute prolapsed:
 - Deceleration type of injury
 - In UDM: Normal sensation
Failure to void – ACD
- ❖ Pelvic Nerve Injury:
 - areflexia, ACD
 - 80% patient may recover after period of one year.
- ❖ **Assisted Bladder Emptying**:
 - Crede's maneuver
 - Easy in thin lax wall patient
 - Valsalva Voiding
 - Downward movement of lower abdominal by suprapubic compression
 - Abdominal straining

Disadvantages:

1. Increase bladder outlet resistance
2. Insufficient emptying
3. VUR
4. Intraprostatic reflux

ANTICHOLENERGICS:

- M.O.A.
 - Classical theory suggestive of they block muscarinic receptors on detrusor.
 - They also decrease urgency, UUI and increase capacity.
 - Compensatory antagonist → so during micturition massive release of ACH can overcome their effect not hampering voiding.
 - Decrease activity of afferent A₈, C fibers during storage.

❖ Tertiary Amines:

- Low molecular weight.
- Lipophilic
- Well absorbed CNS penetration

1	Oxabutinine:	M ₁ , M ₃ > M ₄	Oral ER/IR Syrup Transdermal Gel Pediatric	5mg OD / 5mg TDS 5mg / 5ml 3.9mg OD 1gm OD 0.1 – 0.2 mg/kg/day
2	Tolterodine	Functional selective to bladder	IR ER	1-2mg BD 4mg OD
3	Deriphenazine	M ₃ selective Old Age CVS Selective		7.5-15mg OD
4	Solifenacin			5-10mg OD
5	Fositerodine			4-8mg OD
6	Trospium			20mg OD

❖ ADR:

- Dry mouth
- Constipation
- Blurred vision
- Increase heart rate
- Q-T prolongation
- Altered cognition

❖ Effects:

- Decrease overactivity, urge incontinence, filling pressure
- Improves QOL capacity.
- Preserve upper tract

❖ **Incidentaloma:**

Unsuspected mass of >1cm diameter found on image done for seemingly unrelated cause.

Incidence 5% - increase as the age of patient increased.

20% incidentaloma are potential surgical lesions.

- On USG right adrenal are easily picked up as liver and IVC forms window.
- Non contrast CT Scan: 70% cases adenoma diagnosed with plain CT Scan.
- < 10 HU low attenuation suggestive of fat lesion → Adenoma
- Adenoma: Having high intracytoplasmic fat.
- Low attenuation value < 10HU.
- Atypical Adenoma: Having > 10HU attenuation value.
- 30% are of atypical adenoma
- D/D of low attenuation value of adrenal lesion: On Plain CT Scan
 1. Adenoma
 2. Atypical pheochromocytoma

❖ For atypical adenoma: CT scan washout study to be done

Absolute percentage washout: comparing non-contrast value to 15 min post contrast value

$$APW: \frac{\text{Enhanced} - \text{Delayed}}{\text{Enhanced} - \text{Non enhanced}} > 60\%$$

Relative percentage washout: Comparing arterial phase with delayed phase

$$RPW: \frac{\text{Enhanced} - \text{Delayed}}{\text{Enhanced}} > 40\%$$

D/D:

RCC

HCC mets to adrenal.

❖ **Adrenal incidentaloma protocols:**

- **Non enhanced plain CT f/b contrast washout study.**

❖ **MRI:**

- Based on signal collected from fat & water for intra cellular lipid evaluation.
- Signal intensity loss on out of phase sequence c/c to in phase image.
- No MRI gadolinium washout study similar to CT available for adenoma.
- **CT is best modality for image incidentaloma.**



- ❖ **Mass: < 4cm 2% malignant potential**
 - > 4 cm – 6cm: 6%
 - > 6 cm: considered as malignant until proved otherwise.
- ❖ **2% incidentaloma can have active lesion**
- ❖ **At 3 years 10% of lesion grows > 1cm**
Re-imagine at 6,12,24 months.
- ❖ **Annual metabolic panel workup upto 4 years if mass > 3cm.**
- ❖ **Increase size >1cm / year on follow-up indication for surgery for incidentaloma.**
- ❖ **D/D of hyper-intense adrenal tumors: On MRI -**
 - Pheochromocytoma
 - Acc of adrenal
 - Mets
 - Ham'g
 - Neural tumors.
- ❖ **Adrenal metastasis:**
From:
 - Ca Breast
 - Ca Lung
 - Recurrent HCC
 - High risk of adrenal mets: Due to rich sinusoidal supply.
 - It may be presented as incidentaloma OR Addison's disease.
 - It may be diffuse OR isolated lesion.
 - Can similar to lipid poor adenoma.
 - MRI: T₂ phase hyperintense lesion.
- ❖ **D/D of calcified Adrenal:**
 - TB
 - Ham'g
 - ACC of Adrenal
 - Mets
 - Pheochromocytoma
- ❖ **Ham'g in Adrenal:**
In adult:
 - Anticoagulant treatment
 - Stress
 - Sepsis
 - Trauma
 - Tumor

In children:

- Obst. Labour
- Sepsis
- Hypoxia
- Ham's disease

PHEOCHROMOCYTOMA (P.C.C.)

- ❖ 5% of incidentaloma are PCC and 25% PCC are presented as incidentaloma.
- ❖ 15% of adult and 30% of child PCC are extra adrenal.
- ❖ 20-50% of extra adrenal are malignant.
- ❖ M.C. location of extra adrenal PCC : **Organ of zakercandal - Anterolateral to bifurcation of aorta & IMA.**
 - Cervical region
 - R. Peritoneum
 - Pelvis
- ❖ **Glenner classification** of EA PCC:
 - Bronchomeric
 - Intra vagal
 - Aortosympathatic
 - Viscero autonomic.

Investigation Protocols:

First do CT scan abdomen if positive, no more investigation

Negative & still biomarkers are positive – MRI

- ❖ **Hereditary PCC:**
 - VHL syndrome
 - NF1
 - MEN 2A / 2B
 - SDH – B/H

PCC in VHL:

Less epinephrine production.

Metanephrine level may normal.

Only normetanephrine is elevated.

- ❖ **Why there is heterogenicity of symptoms in PCC?**
 - PCC having enzyme PNMT and ability to self merabolised catacholminae within tumor.
 - Tumor having deferent composition of enzymes.
 - Great variability in amount and ratio of catacholamine secretion.

❖ **Rule of 10% for PCC:**

- 10% bilateral
- 10% hereditary
- 10% malignant
- 10% EA
- 10% childhood

But breach in 10% rule:

25% EA now

30% familial PCC

❖ **Malignant PCC defines only with metastasis.**

Local invasion doesn't suggestive of malignant PCC.

❖ **Classical triad for PCC:**

- Headache.
- Episode of perspiration.
- Tachycardia.

C/F for PCC:

1. **Due to HT.**
2. **Due to catecholamine over production.**
3. **Due to complication of over production.**
4. **Other familiar syndrome stigmata.**

HT in PCC:

1. **Episodic**
2. **Sustained**
3. **Paroxysmal HT on sustained HT**
4. **Normotensive 20% patients.**

Precipitating factors:

Tight cloths

Micturation

Exercise

Coughing

Food (wine, chocolate).

Imagine of PCC:

Well circumscribe, high vascular and low lipid > 35 HU. Content.

Some PCC are lipid rich which can confused with lipid poor PCC < 10HU.

MRI:

Single drop out not seen

Bright signal intensity on T₂W.

Light bulb sign.

No risk of hypertension crisis with iodinated contrast used.

- ❖ **FDG PET:** Best sensitivity for all PCC exp. MEN-2A PCC
MIB6: Meta Iodo benzyl guanidine
- ❖ **Indication for PET in PCC:**
 - Extra adrenal
 - Metastatic
 - Recurrent
 - Negative cross section imaging with positive function test.
- ❖ **Catecholamines and their morbidities conjugated with sulphates.**
Fractionated: Amount and relative conc. of each components such as-
 - Metanephrine
 - Non-metanephrine
 Both collectively called as metanephrines.
- ❖ **Metanephrines used for PCC not VMA or catecholamine level.**
Because-
 1. Catecholamines are produced in paroxysm not constantly.
 2. Metanephrines form constantly by COMT enzyme from catecholamines. This process takes place in tumor itself and constant then only metanephrines entering into blood. So high sensitivity.
 3. VMA is final end product of catecholamines by MAO. Occurs in adrenal and sympathetic nervous system.
- ❖ **Free plasma metanephrines and 24 hours urine metanephrines (fractionated) are considered as investigation of choice for PCC functional status.**
- ❖ **Plasma Metanephrines:** Easy to collect samples.

• Normeta – 112 ng/dl	Normal > 400 ng/dl
• Metanephrines – 61 ng/dl	Normal > 235 ng/dl

 Sensitivity: 99%
 Specificity : 82-95%
 Confirm – PCC
- ❖ **Prior to testing:**
 - NBM for 12 hours.
 - Avoid coffee and smoking for 1 day.
 - Avoid acetaminophen for 5 days.
 - TCA, Parkinson's drug for 1 day.
- During repeat testing-**
 - Stop beta-blockers
 - Supine position for 30 minutes
- For intermediate testing results -**
 - Repeat test with precautions
 - Urine for metanephrines.
 - Clonidine supp. Test can done

❖ **Urine 24 hour metanephrines test:**

- High specificity but difficult to collect samples.
- Ideal for incidentaloma
- As high value of result make interpretation easy.
- Inappropriate for patient with CKD.

❖ **Indication for genetic screening:**

1. F/H/ of PCC
2. Age < 50 years
3. Bilateral PCC
4. Multiple PCC → VHL, SDHB

No need for screening for NF gene.

❖ **Roison's Criteria's:** For adequacy of alpha blockers

1. BP: No indoor BP prior to surgery > 160/90mmHg
2. No orthostatic hypotension BP <80/45
3. No >5 VPC/min
4. No ST/T changes within 1 week of surgery

All patients with function pheochromocytoma even with normal blood pressure or lack of symptoms:

- **Must undergo pre operative catheter blockage**
- **Pre operative ECG and 2D echocardiography must.**

❖ **α Blocker:**

Phenoxibenzamine irreversible α blockage

Action reverses only after new α receptors synthesis for 3-5 days.

10mg twice daily for 10-14 days prior to surgery.

(C) 0.2mg/kg. 4 times max 10mg.

(A) 1mg/kg – avoid on day of surgery

Availability is issue.

Now prazosin and other α blockers are used.

❖ **β Blockers:**

To overcomes α blockage induced tachycardia.

Never start before α blockage.

As β Blockage leads to potential α action → more HT.

Metoprolol – 25mg.

❖ **Calcium channel blockers:**

Can be an option for mild symptomatic patients.

Can be used adjuvant to alpha blockers for control of BP.

It doesn't produce reflex tachycardia. No need for beta blockers along with it.

Amlodipine – 10mg OD

Nifedipine – 30mg OD

❖ **Metyrosine:**

Catecholamine rate limiting enzyme.
3 days prior given.
250mg TDS
Not given on days of surgery.

❖ Pre operative IV hydration must be maintained to minimize prolonged hypotension post surgery.

❖ Avoid morning dose of antihypertensive.

❖ **Post operative complications:**

- **Hypotension**
- **Hypoglycemia**

❖ **Induction with:**

Propofol
Thiopentone
Not using ketamine

Use Vacuronium

For maintenance:

Desflurane
Sevoflurane

❖ Antihypertensive during surgery for Crisis :

- NTG
 - Sodium Nitroprusside
 - Nicardipine
 - Magnesium sulphate: 1-3gm
- Direct catecholamine countering effect.

❖ Vasopressor during surgery to be used for sudden hypotension:

- Vasopressin
 - I.V. methylene blue : decrease C-GMP 2mg/kg
Vasculoplegic action
 - Dopamine
 - Noradrenaline
- Esmolol for intra operative arrhythmia.

❖ **Follow up:** After 2 weeks of surgery

Functional level study must be normal. If increase then MIBG to detect mets.
Life long follow up is needed.
Annually metabolic evaluation.
Imaging: only to document comp. PCC resection.

❖ **Hereditary PCC:**

Council for malignant PCC.
Council for bilateral surgery.
Council for life long hormone replacement.
Plan: Bilateral partial adrenalectomy

❖ **Metastatic PCC:**

- Mostly palliative surgery.
- Adrenalectomy: For symptomatic relieve.
- No survival advantage
- Radioactive MIBG for systemic mets.

ADRENAL CARCINOMA

❖ **Bimodal age distribution**

1st decade – and 4 to 5th decade

Associated with:

Li – Fraumani
Lynch syndrome
Carney complex
Maccuni Albright syndrome

50-70% are functional tumor

In © **90%** are functional tumor

But functional tumor doesn't always symptomatic tumor and it is common that single tumor have multiple hormonal secretion and hormone secretion status can changed.

❖ **M.C. Hormone Secretion: Cortisol ACTH non dependent**

❖ **Radiological features s/o.: ACC**

Large >6 cm lesion
Irregular margins
Irregular enhancement
Calcification
Necrosis
Cystic degeneration
Higher attenuation value and doesn't have contrast wash out.

❖ **Indication for biopsy in ACC:**

Locally advance
Metastatic tumor
Inoperable tumor
All suspected patient of ACC
Do CT chest + Abdomen Pelvis to rule out metastasis.

Malignancy can define only by:

- **Metastasis**
- **Present of invasion**

❖ **On Histopathology:**

WEISS Criteria –

- Total 9 criterias. ≥ 3 present suggestive of malignancy.
 - High grade
 - Mitotic rate
 - Abnormal mitotic figures
 - Atypia
 - Presence of necrosis
 - Capsular, LVI, Sinus involvement

❖ **Treatment:**

En block surgical removal + retroperitoneal LND.

In c/of mets cytoreductive adrenalectomy to decrease symptoms.

Decrease hormonal symptoms

Follow up -

CT Scan 3 monthly for 2 years

After 2 years decrease duration.

Indication of adjuvant RT post surgery in ACC:

- **Localized ACC**
 - **Comp RO resection**
 - **Ki67 < 10%**
 - **Size < 8cm**
 - **No LVI**
- } **No need for adjuvant RT, otherwise RT needed.**

❖ **Mitotane:**

Oral synthetic derivate of DDT.

500mg TDS \rightarrow 6-8 gm/day given.

Ideal normal serum level 14-20 ng/dl.

Complications:

Feminization of male

Increase LFT

Decrease platelet count

Altered thyroid function

Increase cholesterol

Given along with steroid as it suppress steroid genesis.

Monitor:

LFT

TSH

CBC

Cholesterol profile

} 3 monthly

- Chemo treatment for ACC: M PED
 - Mitotane, cisplatin, Etoposide, Doxorubicin

ACC in @: 90% function tumor

Virilisation M.C. Symptom



Tumor < 550gm
 Size < 10.5cm } Good Prognosis.
 No Mitosis.

❖ **Pseudopheochromocytoma:**

Over production of catecholamines from physiological or pharmacological sources.

❖ **HypoK⁺ in PCC:**

Due to β_2 stimulation



Intracellular shifting of K⁺

❖ **Why paroxysmal HT in PCC:**

Variety of conditions leads to increase surge of catecholamine release from tumor without otherwise quiescent leads to paroxysm of HT.

❖ **Why orthostatic hypotension in PCC:**

- In PCC increase vasoconstriction, volume depletion and inhibition of baroreceptor reflex
- Increase secretion of vasodilatory compounds to overcome vasoconstriction of PCC.

So sudden vasodilatation in volume depletion state leads to orthostatic hypotension .

❖ 75% of patient with sustained HT improved with surgery

25% of patient will not → due to chronic sensitization of catecholamine leads to sustain HT by vessel remodeling

95% patient of paroxysm HT improved with surgery of PCC

❖ **Cardiomegaly in PCC why?**

- Global vasoconstriction leads to decrease myocardial blood
- Ischemia, fibrosis or myocardium.
- Decrease amount of β receptors

Combines decrease pump action of heart

Reversible with alpha blockers

❖ **Small PCC are more symptomatic than large PCC as small tumor bind catecholamine poorly so severity of symptoms more.**

Large tumor more catecholamine but they can combine with more enzymes and metabolized in tumor.

So, less effective enters from tumor.

Large tumor less symptomatic

❖ **Pheochromocytoma: Greek word means dark colour**

Mayo performed 1st adrenalectomy for PCC

Gayner performed 1st lap. Adrenalectomy for PCC

❖ **PCC with pregnancy:**

- MRI is investigation of choice
- Alpha blocker can be given safely.
- 1st trimester: Abortion and surgery



- 2nd trimester: surgery can be done
- 3rd trimester: less and fiby surgery.

❖ DID of HT in young age:

- PCC
- RVH
- Renal Parenchymal disease
- AV malformation
- Renonoms

❖ Zone fascicularis secreat 20mg cortisol daily

Maximum circardian rhythm at morning

Dadir at 11pm

ACTH required for monitoring viability of adrenal

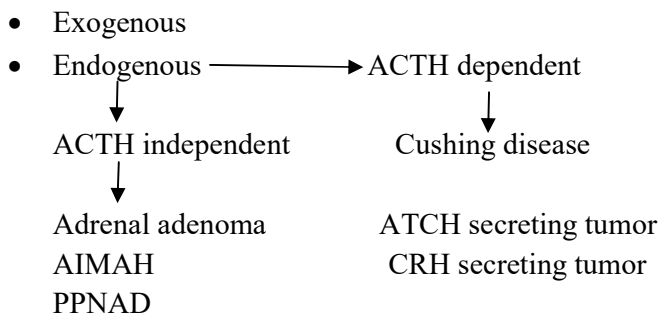
In ACTH deficiency all cal's excepts minerolocorticoids expires.

❖ M.C. cause of cushing's: Exogeneous corticosteroid

Cashing's disease: ACTH dependent pituitary gland tumor related cushing syndrome

70% of endogenous cushing syndrome

❖ Causes of cashing's syndrome:



❖ Indication for screening of cushing's syndrome:

- Patient having features of cushing syndrome
- Paitent with any of below:
 - Metabolic syndrome
 - Hypogonadotropin hypogonadism
 - Osteoporosis < 65 years
 - Incidental adrenal mass
 - Recurrent stone with cushinoid features

❖ Pre – clinical / pre cushing syndrome:

Patient doesn't have typical sing and symptoms of cushing's syndrome but having elevated S. cortisol on metabolic work up.

❖ 24 hour urinary free cortisol not sensitive enough for indicentaloma workup.

❖ LD-DST (low dose dexamethasone suppression test)



Suppress LD = 3-4 times of physiological dose given which suppress ACTH production and serum cortisol.

But in Cushing's syndrome relative insensitivity of pituitary adenoma to inhibitory effect of glucocorticoids fails to suppress corticosteroid level $< 5\text{ng/dl}$

s/o. Cushing's disease

for testing 1mg dexamethasone at 11-12pm

blood test at 8-9am

CYP450 inducer : Negative result.

CYP450 inhibitors: False positive result.

- ❖ Late night salivary testing: 11pm
Rationale: loss of circadian rhythm
 $> 145\text{ ng/dl}$ S/o. CS
False positive:
 - Stress
 - Brushing at night
 - Altered sleep pattern
 - Tobacco chewing
- ❖ Urinary free cortisol 24 hours:
 - Advantage of not affected by corticosteroid binding factors but not useful in CKD patients.
- ❖ ACTH Level: 50 pg/ml
S/o. ACTH dependent Cushing's syndrome
- ❖ To differentiate between ectopic ACTH or Cushing disease:
Petrosal vein sampling
High level of petrosal vein ACTH
S/o. Cushing disease after CRH stimulation test
- ❖ Management of Cushing disease:
Trans sphenoidal pituitary resection
Complication: Hypopituitarism
Failed primary surgery: Bilateral adrenalectomy can be done
If primary bilateral adrenalectomy done then lack of feedback inhibition and rapid enlargement of pituitary tumor.
Leads to blindness – increase IG : Optic chiasma compression
“NELSON SHALSA SYNDROME”
- ❖ Medical management of hypercortisolism:
 - Metyrepon
 - Ketoconazole
- ❖ Primary hyperaldosteronism (Conn's disease) vs secondary HT.
10: No raised level of renin, only aldosterone level raised
20: both renin and aldosterone level increase

Conn's syndrome

Increase mineralocorticoid – increase Na^+ retention. Water retention

But as water retention – Activation of ANP

Leads to natriuresis → prevent body weight to increase by > 1.5 kg.

❖ Indication for screening of conn's disease:

- Early onset HT
- Severe HT
- HT with Hypo K^+
- HT with adrenal incidentaloma
- Resistant HT (>3 drugs)
- Unexpected Hypo K^+
- HT with F/H of conn's disease

❖ Before screening of conn's disease: Hypo K^+ must be corrected

Beta blockers stop for 6 weeks

Morning plasma renin and aldosterone level to take

Aldosterone renin ratio: >30

Aldosterone $> 20\text{ng/l}$

S/o. conn's syndrome

❖ Positive screening test: Must undergo confirmatory test by either of –

- Oral sodium loading test
- IV saline infusion test
- Captopril suppression test
- Hydrocortisol suppression test

And then localization done for surgical candidate patient

Localization done by CT scan

and if not then – Adrenal vein sampling test

❖ Adrenal gland supply:

Artery:

- Sup. adrenal branch of inf. Pyretic
- Middle adrenal b/o aorta
- Inf. Adrenal b/o renal artery

Vein:

- RT → IVC
- LT → Renal vein

3 pattern of blood supply to adrenal:

- Capsular artery to capsule
- Cortical sinusoidal capillary – supply to cortex and into medullary sinusoids.
- Medullary artery supply

❖ Adrenal LN drainage: Paraaortic from diaphragm to I/L renal artery

❖ Normal adrenal on CT Scan:

Inverted Y or V shape

Limb of Y or V are 4-5mm thick.

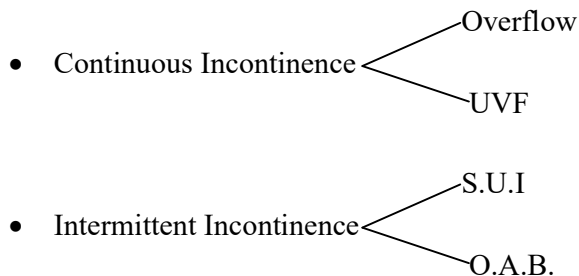
C/C to surrounding crura

Rt. Adrenal: posterolateral to IVC

Lt. Adrenal: Post to splenic artery

- ❖ MRI: T₁W: Isodense to liver. T₂W: Difference to image from perinephric fat having high lipid

❖ VVF must be distinguished from



❖ VVF:- Continuous incontinence with no normal voiding as continuous leak from VVF

If very small VVF then patient can have normal voiding.

C/c of UVF:- continuous incontinence with normal voiding from opposite ureter filling the bladder.

❖ Positional incontinence: Supratrigonal small VVF. when patient lying down amount of leakage low due to position. But more during working.

❖ Pain is not feature of VVF.

❖ VVF after hysterectomy manifest mostly after 2-3 weeks post operative after removing PUC.

❖ **High association for post operative VVF after hysterectomy:**

- Prolonged paralytic ileus
- Haematuria
- Bladder irritability
- Increase post of WBC.

❖ **High risk patients for VVF post hysterectomy:**

- Prior LSCS
- Endometriosis
- Infection / PID
- DM / Arthrosclerosis
- Prior RT

❖ **Mechanism for post hysterectomy VVF:**

- Inadvertent injury to bladder during hysterectomy
- Tissue necrosis by cautery
- Suture placed through vagina cuff and bladder
- Attempt to control pelvic bleeding.



- ❖ M.C. location of VVF after hysterectomy: Anterior vaginal vault
- ❖ **HUTCH CRITERIAS** to prevent fistula formation:
 - Immediate identification
 - Watertight closure
 - Extraperitoneal drain
 - Prolonged catheterization.
- ❖ Urine routine & micro and urine culture & sensitivity must be done before VVF repair:

To rule out UTI

But having high chances of vaginal contamination and difficulties in sample collection.

So pooled vaginal urine sample should be used.
- ❖ Cystoscopy: Must for all patients with VVF

Looked for:

 - Location
 - Size
 - Number
 - Relation to U.O.
 - Any suture material
 - Mucosa surrounding VVF
 - Urine jet from U.O.
 - For **Biopsy** if suspicious for malignancy

If VVF post RT
- ❖ MCUG:

Only if fistula not localized on P/V examination

Most important: **Lateral films**

As in lateral films bladder and vaginal are not superimposed

Tract visualized

Voiding phase: small fistula visualized due to pressure during voiding.

Advantage:

 - Objective demonstration of fistula.
 - Bladder capacity, BN, cystocele can be demonstrated
 - Any other bladder pathology can be known.
- ❖ Role of upper tract imaging in VVF:

12% of VVF are associated with I/L UVF.

so CT IVP is must. It identifies:-

 - ureter course
 - Any collection
 - Identification of UVF
 - any fistula near U.O. to look for U.O. course
 - Post RT / malignancy to look for malignancy

Vaginal tampon should be kept to improve sensitivity of small fistula.

❖ **Causes of VVF:**

- Gynec post surgery –
 - Adominal / vaginal hysterectomy
 - Vaginal biopsy
 - Anti incontinence surgery
 - TRU-BT
- Obstructed Labour
- Malignancy
- Post RT
- FB trauma
- Infection, inflammation

❖ **Obstructed labour injury complex:**

Each of following should be present in varying amount due to prolonged obstructive labour with CPD.

- BN injury, loss of urethra
- Hydroureteronephrosis
- Rectourethral injury
- Rectal atresia
- PID
- Renal failure
- Secondary infertility
- Osteitis pubalgia
- Stress incontinence

Mostly due to cephalo pelvic disproportionate

In small age pregnancy and poor obstructive care (area).

❖ **Role of PUC in VVF:**

- Continuous leak
 - Bad odour
 - Excoriation
- } can be prevented by PUC due to VVF

But prolonged PUC leads to overactivity and psychological trauma due to PUC

❖ **Conservative management of VVF:**

- Patient with < 5mm fistula
- Immature fistula
- Simple injury not involving devascularisation.

Trial with per urethral catheter along with anticholinergics can be tried.

Immediate catheter insertion to prevent epitheliasation of tract.

❖ **O'CONOR CRITERIAS for minimal invasive management for VVF:**

- VVF must be of < 5mm
- Oblique fistula tract
- No inflammation around fistula
- Mature epithelial tract

This fistula can be managed with fulguration of tract.

Electrode or colin's knife slowly withdrawn from fistula tract by coagulating the tract.

Edges of fistula tract should blanch.



Fibrin sealant can be used.

Post op: PUC and anticholergics must be continued.

❖ **Principle for VVF closure:**

- **Multilayered**
- **Water tight**
- **Tension free**
- **No overlapping suture line**
- **Use well vascularised flap**

❖ **Timing of VVF repair:**

- **VVF associated with obstructed labour:** wait for 3-6 months to maximum demarcation of ischemic tissue and resolution of inflammation.
- **Post RT:** wait for 6-12 months as having obliterative endarteritis and decrease vascularity.
- **Classical cases** should be upto 3 months.

Advantages:

- Decrease inflammation and tissue odema.
- Optimum pliability of tissue.
- Easy identification of tissue plane.
- Decrease bleeding.
- Easy re-approximation of suture.

But, uncomplicated, post gynecological fistula can be repaired in immediate post op period. Abdominal hysterectomy fistula can repair vaginally as early can be operated after 2-3 weeks.

❖ **VVF Approaches:**

- **Transvaginal fistula repair:**
- Low lying fistula and fistula at trigone
- Fistula located high at cuff difficult to operate.

Advantage:

1. Short OT time
2. Less pain
3. Early recovery minimum pain and bleeding.
4. Decrease hospital stay.
5. No need for bivalving bladder.
6. Simultaneously anti incontinent surgery can be done.

D. Adv:

- Disfigurment of valva
- Dysperiunea – shortening of vagina
- Urologist are not familiar with vaginal anatomy

- **Transabdominal Repair:**

Indication:

- Large fistula
- Post RT VVF
- High located fistula

- Prior failed fistula
- Need for ureteric re-implant
- Small bladder – needs for augmentation
- Inability to lithotomy position.
- Deep narrow vagina.

D.Adv:

- More pain and morbidity.
- Bivalving bladder – may leads overactivity.
- More hospital stay.
- More cosmetically unsightly.

- **Combined abdominal & vaginal approach:**

- Large complex fistula
- Recurrent VVF after prior attempt of repair.

❖ **Excision or not for fistula tract???**

No excision of fistula tract rationale:

- Results in large soft tissue defect difficult to repair.
- More bleeding – using cautery for tract more ischemia.
- VVF near U.O. – lead to re-implant of U.O.
- Fibrous tract leads to firm holding of tissue.

❖ **Indication for flap / graft:**

- Iridiated tissue RT induced VVF.
- Closure under tension.
- Obstructive fistula.
- Large fistula.
- Prior failure of repair.

❖ **How will you council patient of VVF?**

- Pre operative document sexual function and activity.
- Ask of dysperiunia.
- Give options to patient for repair.
- Explained for 2-4 weeks PUC post surgery.
- Patient may have post surgery urgency / frequency after removal of PUC.
Mostly self resolving
- Success rate > 90%

❖ **Role of pre operative estrogen application:**

- For prior to VVF vaginal approach repair
- Increase vascularity
- Improves local tissue healing

❖ **Post operative drainage:**

- SPC + PC both ideally.
- Single drainage may block, obstruct, clog, - resulting in bladder distension.

- Disruption of suture line.
- Keep PUC + SPC both for 2-3 weeks.
- Cystogram at 2-3 weeks during removal of PUC
- To document integrity of repair.

❖ **Indication for urinary diversion in VVF:**

- Surgery not possible in pre existing malignancy.
- Severe radiation damage.
- Multiple prior repair.
- Severe large obstructive fistula which is inoperable.

Management options are:

- Urinary conduits.
- Ligation of ureter and lifelong PCN.

VAGINAL VVF REPAIR

1. Latzko Repair: High partial colpoclesis

- Identify VVF tract and then 2-3 cm area surrounding denuded from mucosa.
- Then denuded area is sutured over each other without suturing bladder.
- Re-approximation of vaginal flap
- 2nd layer closure

Advantages:

- Easy
- Higher success rate
- Less complication

Disadvantages:

- Vaginal shortening

2. Ratz Repair:

3 layers or 4 layers repair without removing fistula tract.

1st layer: bladder wall and fistula 3 or 4-0 vicryl.

2nd layer: pre vesicle fat

3rd layer: graft / flap

4th layer: vaginal flap

3. Wabster Repair:

- VVF is isolated and entire position of tract excised.
- Closure in 3-4 layers

Advantage: No need for vaginal flap shorting or mobilization.

For vaginal approach of VVF repair:

- Lithotomy positon.
- Put rgc pre op.
- Vagina should be in sterile drape.
- Put PUC.

❖ **Causes of failure after vaginal VVF repair:**

- **Vaginal atrophy**
- **Inadequate nutrition**
- **Post operative spasm of bladder**

ABDOMINAL APPROACH

1. **O'connoll:** Complete bilaving of bladder upto VVF and repair.

Modified O'connoll:

- No need to bivalve bladder.
- Only posterior wall is incised.
- VVF is excised and repair.

2. **Gilvarnate Transvescicle:** From transvercically excise the VVF and mobilized vaginal flap transvesically.

❖ **Laparoscopic VVF Repair: Modified o'connoll method**

Adv:

- Minimal surgical trauma
- Low morbidity
- Less hospital stay

D.Adv:

- Difficult to operate in c/o adhesion and information.
- Difficult intracorporal suturing.

- 4 port method during surgery: put vaginal pack to prevent leakage of pneumoperitoneum.

After removal of vaginal pack loss of penumoperitoneum. S/o. incomplete repair.

After removal of pack, if repair completes then penumoperitoneum doesn't lost.

❖ **Various interpositional tissue graft / flap:**

• **Transvaginally:**

- **Martius Flap**
- **Peritoneal flap**
- **Gracilis muscle flap**
- **Labial myocut flap**

• **Transabdominal:**

- **Peritoneal flap**
- **Greater omentum**
- **Rectus abdominus**
- **Free bladder mucosa**
- **Int. submucosal flap**

❖ **Martius Flap:**

Indication:

- Vaginal VVF repair low trigonal VVF.
- Urethral diverticulectomy.

- Urethrovaginal fistula.
- Failed SUI surgery.
- Erosion of sling into vagina.

Martius Flap:

- Labial fibro fatty tissue

Supply by:

- Superiorly: Ext. Pudendal artery
- Inferiorly: Int. Pudendal artery
- Laterally: Obturator artery

Dissection Limits:

- Medially upto labia minora
- Lateral labiocrural fold
- Posteriorly colle's fascia covering urogenital diaphragm
- Flap mobilized on superior or inf. Pedicle
- Rest two pedical sacrificed.

D.Adv:

- Disfiguring of vagina
- In high injury fistula can't used

❖ **Peritoneal Flap:** For high lying fistula

- Peritoneum is not opened
- Mobilized over fistula

❖ **Omentum:**

- Mobilized easily with vascular pedicle.
- Ability to heal even in presence of infection.
- Inhabited lymphatic property.
- Epithelisation takes place on surface easily.
- Mobilization done on right omentum artery.
- Right G.E. artery distally located – easy to reach pelvis.

❖ **Bladder mucosa patch:** From cystostomy site

❖ **Post operative care for VVF surgery:**

- Remove vaginal pack – 1st POD
- Allow light work by 1-2 week
- Post operative anticholinergics must
- Allow sex after 3 months
- PUC removal after 3 weeks after doing dye study

❖ **High chances of SUI post VVF vaginal repair:**

- **Neuropraxia**
- **Injury to pelvic supportive organs**

❖ **What to do if multiple small VVF on scopy?**

- Convert them into single large VVF and repair with intermediate flap.

❖ **What to do if post VVF repair leakage?**

Day 1:

Pericatheter:

- Overactivity
- Full bladder (not drain properly)

Pervaginal:

- Blocked PUC
- Associated with UVF
- Missed small VVF
- Peritoneal vaginal fistula
- Foleys irritating suture line: prone position may hap.

Leak after PUC Removal:

- Re insert PCU for 1-2 weeks.
- Even after 1-2 weeks – leak – re-explore after 3 months.

Leak after 1 week of PUC removal:

- Mostly BOO infection

❖ Advise VVF patient for pregnancy:

1 year after surgery and always do LSCS for delivery.

❖ **WHO CLASSIFICATION FOR FISTULA:**

• **Simple / Good Fistula:**

- VVF < 4cm size with no tissue scar
 - No involvement of continence mechanism
 - Minimal loss of tissue
 - No circumferential defect
 - No previous attempt of surgery
 - Ureter opens into bladder.
- All must be present.

• **Complex Fistula:**

- VVF with rectovesical fistula
 - Size > 4cm
 - Inv. of continence mechanism
 - Severe loss of tissue
 - Circumferential loss of tissue
 - Prior attempt of repair
 - VVF after RT
 - VVF with stone.
- Any of above is present then considered as complex fistula.

UVF

Arterial supply of ureter:

- Proximal ureter: Medially from renal artery, aorta or gonadal artery.
- Mid Ureter: Posterior from Common iliac artery
- Distal Ureter: Laterally from sup. vesical artery

- 10% of female having L/U supply from uterine artery branches and these branches severed during hysterectomy
- So patient may developed late UVF.

❖ Causes of UVF:

- Gynec surgery:
 - o Abdominal hysterectomy
 - o Vaginal hysterectomy
 - o Radical hysterectomy
- Vascular surgery
- Colonic surgery
- Malignancy
- RT
- Trauma

Vaginal hysterectomy has less risk then abdominal hysterectomy. Open surgery vs lap surgery doesn't have any difficult in UVF rate.

❖ MOA for UVF to occur:

- Comp. transaction of ureter
- Laceration
- Suture
- crush injury
- Ischemic cautery injury

MC location of uterine injury:

- **Infundibulopelvic ligament**
- **At uterine artery**
- **At anterior vaginal fornix**

Mostly distal 2/3 of ureter.

Injury to ureter → urine extravasation - Urinoma → surgical plane deranged → Drain through vaginal cuff → infection and ischemia → fistula
Mostly developed 1-4 weeks after surgery

❖ Causes of ureter injury during vascular surgery:

- Devascularisation during aorto femoral bypass OR
- Post surgery inflammation
- UVF is late manifestation

❖ High chances of UVF for endometriosis hysterectomy:

- As endometriosis pushes ureter medially
- Intraperitoneal adhesion – ureter visualization difficult
- Sometimes ureter may be involved

❖ UVF patient may present with

- Fever
- Flank pain
- N/v

But pain mostly marked in post operative period

❖ **CT IVP: Investigation of choice:**

- some degree of obstruction and upper tract dilatation in early phase along with drainage into vagina.
- urine may seen in vagina in pre void film.

- delineation of urinomas.
- Anatomical detail also delineated.

IVP: High oblique or lateral film must needed to delineated fistula.

- ❖ **RGP:** May have abrupt termination of distal ureter or delineation of with UVF.
 - Once diagnosis of UVF is made every attempt to pass DJ stent as it have some obstructive element
 - Now a day early repair is preferred.
 - Neoureterocystostomy should be done.
 - Don't go to injury site.
 - Dissect as distal as possible.
- ❖ Methods of check urethral normalcy during surgery:
 - Visualization of ureter in ureterosacral ligament area.
 - Pre operative DJ stenting → doesn't decrease injury chances.
 - Pre operative light emitting RGC.
 - Pre opearative hydration and lasix.
 - IV indigo ceramine and do cystoscopy to look for jet.
 - Cystoscopy only to look for urine jet.
 - Grasping of ureter with forceps for peristalsis and leak.

6

Autosomal Dominant Polycystic Kidney Disease (ADPKD)

- ❖ In ADPKD all nephrons affected by generic mutation but only 1-2% nephrons will develop cyst. Because of Knudson two hit theory
Only nephrons which have disruption in second allele will have cystic enlargement.
- ❖ **Pain in ADPKD:**
 1. Mass effect
 2. Inflammation of cyst
 3. Bleeding into cyst
 4. Stone / clot colic
- ❖ **Hypertension in ADPKD:**
Renin mediated – secondary to stretching of intra renal vessel around cysts – leads to distal ischemia.
Increase renin level
- ❖ No anaemia in ADPKD patient with ESRD: As increase erythropoietin level release from kidney
- ❖ CNS manifestation of ADPKD:
 1. SAH: Mostly from Berry's aneurysm
 2. Intracranial Hem's: From HT. rupture of intracerebral artery due to severe HT
- ❖ Seminal vesical cyst very rarely cause infertility but they have some impaired motility of sperm.
- ❖ No increase risk of RCC in ADPKD:
- ❖ **Diagnosis of RCC difficult in ADPKD due to**
 1. Multiple cyst
 2. Tumor masked by multiple cyst appearance
 3. Cystic Hem's blood clots, proteinaceous material can hamper diagnosis.
- ❖ **Screening of family members for ADPKD:**
Advantage:
 1. Making diagnosis that can affect family planning
 2. Early identification of disease and complication so early management can be done
 3. To select live donor from family.Disadvantages:
 1. Anxiety to patient
 2. Psychological stress
 3. Problem in insurance and employment
- ❖ **Indication for genetic screening in ADPKD:**
 1. When definitive diagnosis is needed
 2. Radiological diagnosis not sure (Equivocal)



❖ **GRANTHUM CRITERIAS:**

When no family history to support ADPKD then bilateral renal cyst and or more of following:

1. Bilateral enlarging kidney
2. ≥ 3 hepatic cyst
3. Cerebral artery aneurysm
4. Arachnoid cyst
5. Pancreatic, Splenic cyst

❖ **Role of ACEI in ADPKD:**

1. Decrease renin mediated HT
2. Increase renal blood flow
3. Renoprotective action with minimal ADR

❖ **HALT PKD Trial:** Largest trial for ADPKD

Role of blood pressure control vs specific treatment on course of disease

Severe blood pressure control associated with slower increase in cyst and volume

No overall effect on GFR

❖ **TEMPO Trial:** Tolvaptin in ADPKD

Suggestive of tolvaptin effective in slowing the disease progress and deterioration of renal function

Prolonged median age of ESRD: 6.5 years

But not cost effective

More ADR \rightarrow Polyuria, Nocturia, Polydipsia

❖ **Indication of nephrectomy in ADPKD:**

1. Chronic severe pain
2. Suspected of malignancy
3. No space for donor kidney
4. Severe Hem'g in native kidney
5. Recurrent stone
6. Severe GIT symptoms (Early satiety)
7. Recurrent infections

➔ **Other options rather than nephrectomy:**

Intra arterial embolisation

Only small study

No enough data

Not used now

❖ **Timing for Nephrectomy:**

Ideal timing is concomitant with renal transplant as it avoids needs for extra surgery and no

need for hemodialysis but operative time prolongs and more urological complications have been noted

There is always controversy for ideal timing of donor nephrectomy

- Asymptomatic patient and nephrectomy needed only for donor kidney space, then do only I/L side nephrectomy
- Post renal transplant liver cyst continued to grow.

❖ **Indication for liver transplant in ADPKD:**

1. Extremely disabling liver symptoms
(Abdominal pain, early satiety, nutritional compromise)
2. Recurrent Infections of liver cyst
3. Impaired QOL

- Combined liver and renal transplant. If $GFR \leq 15 \text{ ml/min/m}^2$. Lower overall survival rate c/c to surgery carried out for isolated transplant. But having advantage of single time surgery, single time immunosuppression.

❖ Somatostatin analogue can be given in post renal transplant patient with enlarging liver cyst and symptomatic.

❖ Evaluation of live donor must include:

- | | | |
|----------------------------|------------------------|------------------------|
| 1. Donor's age > 40 years: | ≤ 1 cyst on USG | } Then only can donate |
| 2. Donor 30-40 years: | No cyst on USG | |
| | Confirm by CT Scan/MRI | |
| 3. Donor < 30 years: | No cyst on USG | |
| | Confirm in CT Scan/MRI | |
| | Normal genetic testing | |

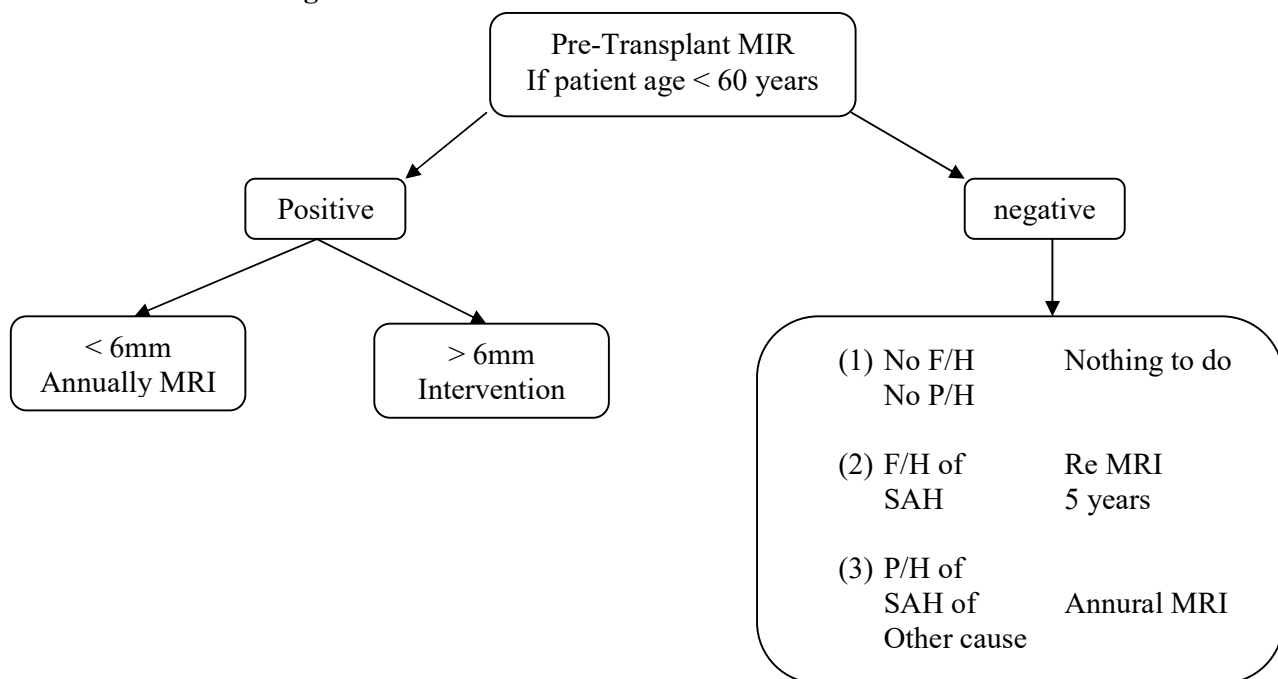
❖ Patient with ADPKD have similar graft and overall survival c/c to other nephrectomy

❖ Native ADPKD volume decrease by 35-40% after transplant. Most of volume decrease by 1 year.

❖ No specific role of M-TOR inhibitors in post transplant,

❖ Dead ADPKD donor: If donor have mild cystic lesion then donation can be done in recipient who have <10 years of life expectancy.

❖ SAH: Screening Protocols:



Screening is done only if age < 60 years.

- High chances of reapture
- After 60 years risk of prophylactic intervention is high, so no role of screening.

❖ Revine Criterias:

0-30 years	Atleast 1 cyst both kidney or 2 in same kidney
30-60 years	Atleast 2 cysts in both kidney
> 60 years	Atleast 4 cysts in each kidney



❖ **PIE modification of Revine**

15-39 years	3 cyst unilateral or bilateral
40-60 years	2 cyst in each kidney
≥ 60 years	4 cyst in each kidney

Useful for any patient with ADPKD

❖ **Risk factors for early ESRD in ADPKD:**

1. ADPKD decrease
2. Male patient
3. 1st haematuria < 30 years
4. Hypertension < 35 years
5. Hyperlipidemia

❖ **CVS Cx of ADPKD**

1. HT
2. LVH
3. CCF
4. Arrhythmia
5. Thoracic aortic dissection

❖ **Indication of SAH screening:**

1. Age < 60 years
2. Family history of SAH
3. Pre-operative evaluation before transplant
4. High anxiety occupation
5. High risk occupant – Pilot

❖ **Indication of surgery in Aneurism:**

1. Symptomatic
2. > 7mm with < 60 years age
3. History of bleeding aneurysm

❖ **Post renal transplant changes in ADPKD patient:**

1. Negative kidney decrease in size
2. Liver cyst continue to growth
3. Intra cranial hem'g & SAH stable
4. New onset DM increase
5. Cardiac morbidity not increase

❖ **Pre transplant bilateral Nx:**

Leads to significant HD unstability and hypotension as R.A.A.S. lost
Patient must be prepare with volume expanders

❖ **Tolvaptin:**

Selective v2 receptor antagonist
 Slows cyst size

Q: what are the chromosomes/Genes/ proteins responsible for ADPKD?

A: gene	chromosome	protein
PKD-1	Chr-16	polycystin 1
PKD-2	chr-04	polycystin 2

Q: what is the inheritance and penetration of ADPKD?

A: Inheritance is autosomal dominant, 2 out of 4 will be affected

Penetration is 100%

Q: what is the incidence of ADPKD?

A: 1 in 400 to 1 in 1000

Q: what are the other extra renal manifestations of ADPKD?

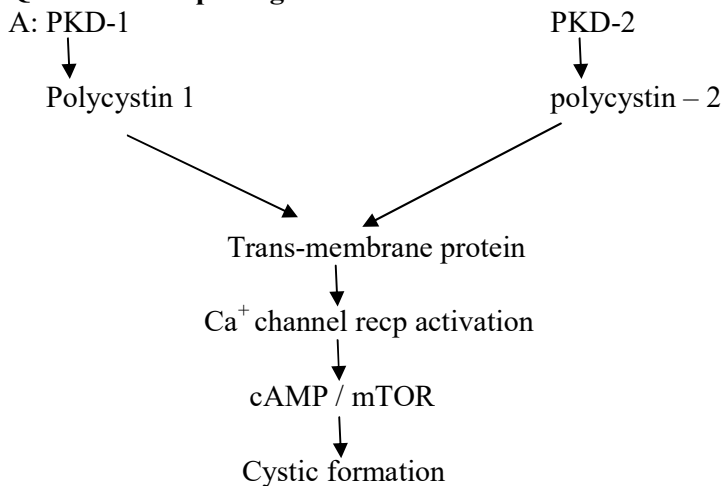
A: Cysts of liver, pancreas, spleen, lungs
intracranial aneurysms / aortic aneurysm
Colonic Diverticulae
Mitral valve prolapse

Q: what is the continuous Gene syndrome?

A: It is the syndrome arising due to deletion of multiple gene loci, which are adjacent to each other

- Multiple gene defects produce Unrelated clinical features
- Eg. PKD-1, & TSC-2 gene both are on Chr 16, so deletion of this specific portion of chromosome 16 will lead to manifestations of both diseases

Q: what is the pathogenesis of ADPKD?



Q: what are the types of ADPKD?

A;

Factors	ADPKD-1	ADPKD -2
Gene	PKD-1 on chr 16	PKD-2 on chr 4
Incidence	85%	15%
Progression	More rapidly progressive	Slow progressive
Cyst appearance	Cysts start appearing by the age of 10yrs 90% of pts will have cysts by age of 20 yr 100% pt will have cyst by 30 yr	100% of pts will have cyst by the age of 40 yrs
ESRD	ESRD occurs @ 50 yr	ESRD occurs @ 70 yr



Q: what are the clinical manifestations of ADPKD?

A: Pt becomes symptomatic @ 30-40 yrs age

- HTN hypertension (80%)
- Hematuria – Gross, } 50%
Microscopic }
- Flank pain: due to abd mass (50%)
- G.I symptoms : secondary to compression
- Renal colic → clots, stones

Q: what types of stones are a/w ADPKD?

A: Stones (30%) → calcium oxalate, uric acid

Q: What is the cause of HTN in ADPKD?

A: Hypertension (70% - 80%), Renin mediated, due to compression of normal renal parenchyma by cysts.

Q: what are the important findings in clinical examination of ADPKD?

A: HTN: young pt with HTN (20 – 30 yrs age)

: Severe HTN

: Rise in diastolic BP is the rule

Phy examination: B/L large palpable kidneys (rule)

: Palpable liver (+/-)

Palpable Spleen (+/-)

Q: what are the extra renal manifestations of ADPKD?

A:

Hepatic cysts (on USG) → Most common (M/C)

- a/w PKD -1 & PKD-2 both
- occurs in 100% pts by age of 50 yrs
- affected by estrogen, so large cysts in females

Intracranial Aneurysms

- aneurysms of circle of Willis (Berry aneurysm)
- leads to subarachnoid hemorrhage
- a/w PKD 1 > PKD2
- less than 1 cm → less risk of rupture
- family H/O of rupture → more chances of rupture

Cysts of.... pancreas, spleen, (5%)

Seminal vesicles (40%)

Mitral valve prolapse (<5%)

Colonic diverticulae (<5%)

Q: what is the risk of RCC in ADPKD ?

A: No specific relation

Risk is equal to general population

Q: What is the gross appearance of kidney in ADPKD?

A: Bilaterally Huge kidneys (>15cm)

Bilaterally multiple cysts with thinned out parenchyma

Maintains reniform shape

Q: What is important in history taking?

A: Ask the history for atleast 3 generations

Ask or HTN /stroke/ renal disease/ renal transplant



Q: What are the USG criteria for ADPKD?

A: USG criteria for ADPKD is devised by RAVINE (RAVINE et al, 1994)

- Holds true for 100% ADPKD - 1
- Holds true for 60% ADPKD – 2

AGE

0-30 yrs..... – atleast 1 cyst in each kidney (or 2 unilateral)

30-60 yrs..... – atleast 2 cyst in each kidney

60yrs – above..... – Atleast 4 cysts in USG each kidney

Q: What is ADPKD –x?

A: patient of ADPKD in which type 1 or 2 is not yet identified.

Q: What is the USG criteria for ADPKD-x ?

A: ADPKD-‘x’ is a person with family history +ve for ADPKD, but unknown genotype

‘Pei’ Criteria

15-40 yrs → at east 3 cysts either Unilateral or bilateral

40-60- yrs → atleast 2 cyst in each kidney

60-above → atleast 4 cyst in each kidney

Q: What are the USG criteria for ADPKD – 2

A: Same as or ADPKD-‘X’

Q: what are the USG criteria for EXCLUSION of ADPKD in a person?

A: for ADPKD 1; No cyst in persons above 30 yrs

for ADPKD 2 and ‘x’: No cyst in person above 40 yrs age

Thus for any person above the age of 40 yrs; with no renal cyst / or one simple cyst means he does not have ADPKD (any type)

Q: what are the differential diagnoses for ADPKD?

A:

- multiple simple cysts
- Acquired renal cystic disease
- Medullary cystic disease
- Orofacial digital syndrome
- Tuberous sclerosis
- VHL

Q: What are more sensitive radiological means to diagnose a cyst ?

A: CT scan & MRI

Q: What are the management goals of ADPKD?

A: Slow down the progress towards renal failure

Control HTN

Control hematuria

Treat UTI

Treat abdominal pain

Correct metabolic complications

Q: What is the dietary advice given in ADPKD?

A: Low fat, low salt diet

Low protein diet

Q: How will you control HTN in ADPKD?

A:

1. ACE inhibitors-Captopril, enalapril, Lisinopril
2. ARBs(Angiotensin Recp Blockers)-Telmisartan, Losartan

Q: How will you control infection in ADPKD?

A: Gram negative bacteria are usual culprits

Antibodies should have good Cyst-penetration

Cyst-penetrating antibiotics -Ciprolaxin, Clindamycin, Chloramphenicol, Cotrimaxazole, Carbapenams

Q: How will you control hematuria in ADPKD ?

A: Bed rest and copious hydration

Q: How can you control abdominal pain in ADPKD ?

A: DO not use NSAIDS

Try tramadol

Use Roving's de-roofing operation

Q: What is the latest in ADPKD Mx?

A: long acting somatostatin analogues (Octreotide) are nephroprotective in ADPKD.

Sandostatin LAR → Brand name of octreotide, dose 20 mg ,cost Rs 650/-



Q: what is the age of ESRD in ADPKD?

A: ADPKD -1 → 50 yrs

ADPKD- 2 → 70 yrs

Q: How will you select donor for ADPKD Patient?

A: Enlist all the willing donors

Wife → Blood group match → accept

Blood related/siblings → needs screening for ADPKD

Q: What are the genetic Tests available for ADPKD?

A:

1. Linkage analysis: L.A uses microsatellite markers that flank PKD 1, 2 genes
2. Direct DNA analysis → using liquid chromatography

Q: How will you select donor for k/c/o ADPKD-1?

A: If Recipient is a k/c/o ADPKD- 1

Blood related donor will also have ADPKD 1

Step 1 – enlist all siblings / parents of age above 30yrs



Step 2- screening USG

- Shortlist all who have no cyst above 30 yrs
- Shortlist all who have maximum 1 cyst between 30 -40 yrs
- Donor **cannot** be less than 30 yrs old
- Sex of the donor **doesnot** matter

Step 3 – of all the short listed candidate after USG

- Do CECT scan or eligible donors
- Confirm that there is no cyst that is being missed on USG
- Rule out other renal pathological like stone, RCC, Adenoma, parenchymal disease

Q: What is the status of genetic screening for donor selection in ADPKD?

A: Genetic study analysis is done

1. If donor wishes to confirm his status
2. Equivocal USG/CT/MRI/ findings

Q: what is the current status of Native nephrectomy (NNx) in a case of ADPKD?

A:

- In routine NNx is not indicated
- Only 20% of ADPKD patient require NNx
- It may be more harmful to do NNx

Q: what are the indications for doing NNx?

A:

- Recurrent infection
- Intractable pain
- Severe GIT compressive symptoms
- Intractable hemorrhage
- Suspected malignancy
- To provide space for Transplanted kidney

Q: what are the disadvantages of doing NNx? Or what are the advantages of maintaining native kidneys?

A: Advantages of maintaining native kidneys are

AVOIDING of

- Fluid overload
- CHF
- Pulm oedema
- Hyperkalemia
- Anaemia
- Renal osteodystrophy

Q: Why does ADPKD patient doesnot have anaemia ?

A: Due to raised erythropoietin secretions

Q: what is the ideal time for doing NNx?

A: At the same sitting with renal Transplant

Q: what is the difference b/w NPH & medullary cystic kidney disease?

	NPH	Medullary cystic kidney disease
Inheritance	Autosomal recessive	Autosomal dominant
Onset	very early	late
ESRD	in teen ages	in adult
Extra renal involvement	+	- negative
Symptoms	Anaemia ,HTN, polyuria, Polydypsia	same but of mild degree
Signs	Proteinurea	mild degree
Mx	Transplant need at early age	Transplant at adult age

TUBEROUS SCLEROSIS

Q: what is the other name of T.S?

A: Bourneville disease

Q: What is T.S?

A: Tuberous sclerosis is an autosomal dominant disease arising due to mutations of TSC genes and characterized by benign growths called hamartomas in all organs of the body

Q: What is TSC triad?

A: Epilepsy

- Mental retardation
- Adenoma sebaceum

Q: what are the genes responsible?

A: TSC -1 on Chr-9

TSC-2 on Chr 16

Q: what is the protein involved?

A: TSC – 1 → Hamartin

TSC -2 → Tuberin

Q: What is the pathogenesis of TSC?

A: Both TSC – 1 & TSC-2 are tumour suppression genes and mutations lead to tissue overgrowth and hamartoma formation

Both Tuberin & Hamartin play an important role in controlling mTOR pathway. Faulty production of Tuberin & Hamartin leads to tuberomas and hamartomas.

Q: What are the major and minor features of TSC?

A:

Major

- Renal AML
- Facial angiofibrosis
- Ungual fibroma (finger nails)
- Hypomelanotic macules
- Shagreen patch
- Cortical tuber (radiological mri finding depicting tubers in cerebral cortex = cortical tubers)

Minor

- Renal cyst
- Rectal polyp
- Retinal achroic patch
- Bone cyst

Q: how many criteria are required for diagnosis?

A: 1 major or 2 minor

Q: What are the presenting features of TSC?

A:

- Epilepsy
- Mental retardation
- Adenoma sebaceum
- HTN

Q: What are the renal involvements in TSC?

A: Renal involvement is second only to brain involvement

- AML- 40-80%
- Renal Cyst → 20-40%
- RCC → 2%
- HTN

Q. What is adenoma sebaceum?



A. These are firm, discrete brown patches

Q. What is “ash leaf” appearance?



A. An early stage skin lesion.



Shagreen patches

Q: what is the specialty about AML in TSC?

A: Bilateral

Multiple

Appear by age of 10 yr

Potential for hemorrhage / mass effect

Causes HTN

} usually < 4 cm but large also

Q: what are the specialties of renal cyst?

A:

- Manifest by age of 3 yrs
- HTN
- Multiple, B/L cysts
- Mimic ADPKD

Q: What is the RCC association with TSC?

A: nothing more than 2-3%

-clear cell

Q: what radiological investigations are needed?

A:

USG for renal cyst, renal AML

CT scan

MRI-head

Skin lesion – biopsy

Genetic evaluation



Q: What are the urological management principles of TSC?

A: For urologist

AML < 4 cm → wait & watch

AML > 4cm → excise

- | | | |
|--|---|--------|
| <ul style="list-style-type: none">- Symptomatic- Bleeding- Female of child bearing age | } | excise |
|--|---|--------|

Management of HTN → ACE inhibitors

Management of Renal cyst → follow up

Management of Renal failure → renal Transplant

→ NNx should be done before Transplant as there is high risk of bleeding in native kidneys

CYSTIC NEPHROMA

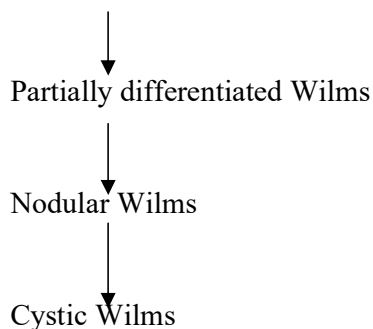
Q: what is cystic nephroma?

A: It is a benign tumour arising from nephrons, grossly it appears as a cystic mass, thus cystic nephroma (c/f adenoma is a solid mass)

Q: Is cystic nephroma truly benign?

A: Cystic nephroma is at the benign end of a continuous spectrum

Cystic Nephroma



Q: What is the age of presentation?

A: Bimodal presentation

Before 4 yr → male

After 30 yr → females

Q: what are the presenting features?

A:

Child

Abdominal mass

Adult

abdominal mass, Pain, Hematuria

Q: What radiological investigations are needed for cystic nephroma?

A: USG Abd and CECT Abd

Q: what is the management of cystic nephroma?

A: Partial Nx or Complete Radical nephrectomy



MEDULLARY SPONGE KIDNEY

Q: what is medullary sponge kidney (MSK)?

A: Medullary → Pertaining to renal medullar

Sponge → due to multiple cyst

MSK → is characterized by multiple cysts strictly confined to medullary region

Q: what is the characteristic hall mark of MSK?

A: Tubular dilation of the distal portion of collecting ducts; which gives an appearance of Bristles on a brush on IVP

Q: What are the clinical features of MSK?

A;

- Asymptomatic
- Renal colic (50%) (m/c)
- UTI (25%)
- Hematuria (12%)
- Stones (6%)

Q: what is the m/c biochemical abnormal in MSK?

A: Hypercalcaemia

Q: what type of stones is a/w MSK?

A: calcium oxalate and Calcium phosphate

Q: what is the Mx of MSK?

A: MSK itself is untreatable

Complications of MSK need to be managed

- Hypercalcaemia → thiazides
- Infn → antibiotics (long term)
- Calculus formation → ESWL/PCNL

Q: what is the difference b/w parapelvic cyst v/s peri-pelvic cyst?

A:

Parapelvic cyst	Peri pelvic cyst
<ol style="list-style-type: none">1. Simple renal cyst2. Originates from renal parenchyma3. Impinges upon renal pelvis4. Unilateral	<ol style="list-style-type: none">1. not easily a renal cyst2. originated in renal sinus3. have a lymphatic origin4. basically a endo lymphatic cyst from renal sinus which impinges upon renal pelvis5. Bilateral

CHAPTER

7

Pelvic Fracture Urethral Distraction Defect (PFUDD)

❖ Bulbospongiosus Muscle:

Origin	: Perineal body midline raphe.
Insertion	: Superficial perineal membrane
	Male: Dorsal and lateral to penile bulb
	Female: Passing outside vagina.
Action	: Male: Emptying of urine.
	Ejaculation.
	Female: Close vaginal introitus
	Erection of clitoris.

❖ Rarity of PFUDD in female:

- Due to:
1. Morbidity of urethra
 2. Short length of urethra

Young female have more likely hood of PFUDD due to thin and less mobile urethra.

❖ Only **10%** of pelvis # associated with PFUD.

5% of pelvis # associated with bladder rupture.

But almost **all PFUDD** associated with pelvic #.

❖ Prepubertal male have high chances of BN injury due to smaller prostate which is less protective.

❖ Korataim's dictum for PFUDD:

- Risk of urethral injury is negligible if ischiopubic rami is not injured.
- High odds for staddle # 3.8.
- Malgaigne # has 3.4 odds.
- 24 times high chances of urethral injury if post SI joint #.

❖ For RGU clamps:

- Brodney or Knutson's clamp
- HSG ballon 3cc inflated
- OR
- 6/8 FR. foley with 5cc ballon influted
- OR
- IV cannula
- OR
- Conical adaptor can used to prevent spillage.

Postion:

Supine with pelvis elevated to 30-45° oblique to horizontal plan. Thigh closer to table flexed at 90° upper thigh is kept straight.

For allowing complete visualization of urethra 20-30cc contras is used.



Ideal RGU:

A jet of contrast is passing through urethra into bladder without extravasation.

- ❖ **There is no evidence that gentle attempt of PUC can convert an incomplete transaction into complete one.**

Arguments against PUC attempt:

1. **It can convert pelvic hematoma infective.**
2. **Hampers accurate staging.**
3. **Can convert partial rupture to complete rupture.**
4. **May go into periprostatic area outside urethra.**

- ❖ **D/D of closed of BN in MCUG:**

1. Anxious patient
2. Radiolucent stone
3. BN injury
4. Primary BNO
5. Healing callus

How to tackle it?

- Relieve anxiety
- Give tablet Siladocin 8mg to relax BN and then do repeat study.
- Pass 5 fr. IFT across BN and do contrast study.
- Do flexyscopy from SPC site.

- ❖ **Indications of PAPA (Progressive Abdomino Perineal Approach):**

1. **Severe fibrosis.**
2. **Bladder neck injury.**
3. **Previous failed repair.**
4. **Fistula (Periurethral bladder base fistula).**
5. **Pediatric cases as corpus is less good developed so less elasticity.**

- ❖ **Indications of PFUDD repair starting with abdominal approach:**

Complex PFUDD associated with abdominal complications.

- ❖ **Adv. of Transpubic Repair:**

- **Tension free repair.**
- **Wide proper exposure.**
- **Omentum wrapping can be done.**
- **Associated fistula and BN can be repaired.**
- **Patient with long standing PFUDD can have bladder stones that can be tackled.**

- ❖ **Causes of voiding tract failure after surgery:**

- Stone or bone fragments.
- Anastomosis under tension.
- Undiagnosed UAD.
- Anastomosis to false passage.
- Obstruction to anastomosis.
- Scar not completely excised.

- ❖ **Complications of pubectomy:**

- Shortening of penis
- Destabilised erection
- Destabilisation of pelvis
- Chronic pelvic pain.

❖ **Tile's Classification:**

Based on integrity of posterior SI complex

Type A : Stable

Type A1 : # not involving pelvic ring

Type A2 : Stable minimal displacement of ring

Type B : Rotational unstable, vertically stable

Type B1 : Open book

Type B2 : Bilateral SI joint # with pubic diathesis.

Type B3 : I/L pubic remi & C/L S/I joint.

Type C : Rotational & vertically unstable

Type C1 : I/L SI joint with I/L pubic remi

Two different level of pelvis

Type C2 : Bilateral

Type C3 : Involving acetabulum #

❖ **Younge Bugress Classification:**

1. Anteroposterior compression #

Increase abdominal and visceral injury.

This injury opens pelvis.

2. Lateral compression #

Close the pelvis

Highly associated with organ injury.

3. #Vertical shear injury:

Full from height

OR

Post forces applied to fixed pelvis

hemipelvic moves from c/l side.

❖ **Stable Pelvic #:**

that can with stand normal physiological forces without abnormal difomation.

Isolated iliac bone #

Upto 3 pubic remi #

Sacrum #

❖ **Unstable pelvis #:**

Deformation on normal physiological forces.

1. Butterfly

2. Ant and post pelvic #

❖ **Pelvic ring not distrupted with minimal trauma.**

10KN (Kelo Newton) force is required.

❖ **Pathology of urethral injury in pelvic trauma:**

- Direct bone injury.

- Wide pubic diastesis leads to rupture of urethra.

- Upward displacement of hemipelvis which leads to lacceation.

- Gillotine type effect of bone on urethra.

Thess findings are based on SANTUCCI's study on cadaver.

❖ **Cooper's Nail Sign: Labial swelling with hematoma in PFUDD.**

❖ **Butterfly Hematoma:** Due to attachment of colic's fascia to perineal memb.

❖ **Indications where direct SPC advisable in PFUDD:**

- High riding prostate
 - Complex pelvic #
 - Butterfly haematoma
- (Dr. Arun Chawla, Dr. N.K. – Mock Exam – 2018)

❖ **PFUDD is due to injury to ligaments: Injured bone leads to prostate and urethra attached with ligaments separated and stretched.**

So if ligaments are injured less chances of urethral injury in pelvic trauma.

❖ **Role of DRE in PFUDD case:**

1. Pelvic haematoma can displaced prostate contour
Detached prostate pulled high
Pie in sky prostate.
2. To rule out rectal injury
3. After 3 months to look weather prostate can palpable in normal position or not?

❖ **Ideal immediate management of PFUDD: Midline high trocar SPC.**

❖ **Primary Re-alignment:** Placement of SPC at time of injury and re-alignment when patient is stable within 4-7 days.

Rational: Not to prevent development of stricture but to convert less severe inense stricture.

Indications:

- No major pelvic #.
- No major extravasation.
- Good expertise and instruments.
- High riding prostate.

Advantages:

Less dense stricture
Later stricture surgery convenient
Technically simple

D.Adv:

More infection
High pelvic abscess rate
More ED and incontinence

Keep PUC for 4-6 weeks

If patient voids after PUC removal, then remove SPC after 1 week

Never give traction on PUC. It will not help to gain continence or less dense stricture. Actually it worses the continence.

❖ **Immediate primary urethroplasty: No role now**

- High rates of ED, Incontinence
- Poor visualization due to haematoma
- Inability to access severed end due to oedema.

❖ **What is ideal time for PFUDD repair ?**

3 months post trauma

Due to – as by 3 months haematoma resolves

- Orthopedic stability
- Patient is mobilized

- **Extend of injury can defined well.**

❖ **Prior to repair ask for:**

- **Sexual function and erection**
- **Look for anal tone sensation**
- **Look for distal pulsation.**
- **Check for squatting position in OPD, if patient can squat then lithotomy position can be given.**

❖ **Indication for MRI gapometry:**

1. Pie in sky prostate
2. Major corporal separation
3. Previously operated case
4. Complex PFUDD

❖ **Indication of penil Doppler in PFUDD:**

- Suspicion of ED
- To documentation of ED

❖ **Importance of beaked bladder neck:**

It is not cleared that pre operative bladder neck appearance co-related with post surgery bladder neck behavior.

Beaked bladder neck importance is only to explained patient that he may have high incontinence rate post surgery.

But it is doesn't change management protocols.

If oval bladder neck: less chances of incontinence.

Funnel bladder neck: more chances of incontinence but this are not specific.

❖ **Indication of scopy in PFUDD:**

1. Bladder neck not opened on MCUG.
2. To rule out stone in bladder.

❖ **What to do if primary SPC site is not ideal, why?**

If primary SPC at low level or lateral then before PFUDD repair put high midline SPC and finger breath above pubic symphysis.

As during repair:

- Metal sound is passed from SPC side over which tissue is resected.
- If SPC to low: Very acute angle for probe.
- If lateral SPC: diff. to negotiate probe / sound.

❖ **Concomitant bladder neck injury don't reconstruct – same stage.**

❖ **Concomitant anterior urethral stricture: Patients are more risk of compromising blood supply and failure of repair. Repair must be done with caution.**

❖ **Cx of PFUDD repair:**

Re-stenosis

ED

Incontinence

- After PFUDD repair: 5-10% have re-stenosis at anatomical site, that can managed endoscopically.
- After PFUDD repair: continence is rule
Incontinence rate <5%
Continence post PFUDD repair by bladder neck only.

- ❖ **ED: 80% patient multifunctional**
 - Cavernosal nerve injury**
 - Anterior insufficiency**
 - Various laek**
 - Direct corporal injury**
- ❖ **ED post trauma co-relates with:**
 - Gap of stricture.**
 - Lateral displacement of urethra.**
 - Wide pubic symphysis separation.**

Majority of patient with ED responds with PD5EI.

- ❖ **Principles of progressive perineal urethroplasty:**
 - 1. Tension free repair**
 - 2. Wide spatulated anastomosis**
 - 3. To gain tension free anastomosis by sequential steps of surgery.**
- ❖ Importance of pre operative x-ray pelvis:
 - To rule out stone in bladder
 - Healing of #
- ❖ Look at obturator foramen, Inferior and Superior pubic rami. And pelvic inlet line.
- ❖ **Additional instrument needed for PPUDD:**
 - Turner warwick's retractor
 - Nasal speculum
 - Bone chisel
 - Hammer
 - Bone punch
 - Bone wax
 - Hay groove's staff dilator
- ❖ **If proximal end not palpable don't dissect it blindly rather do puncturing with spinal needle and looking from SPC site with scopy.**
 - Blind cutting can lead to dissection by side of urethra.**
- ❖ **During surgery we can confirm that we are in urethra?**
 - On proximal end veru must be seen, which is very less likely to damage with injury
- ❖ **During surgery care must be taken not to injured dorsal penile artery and nerves, which are lying on either side of inner aspect of suspected crura.**
- ❖ Posterolateral at BN junction 11 & 1 o'clock position - Urethral artery to control during surgery.
- ❖ Distal limit of mobilization is: penoscrotal junction – to limit chordea.

- | | | | | |
|--|---|---|---|---|
| <ul style="list-style-type: none"> ❖ In | <ul style="list-style-type: none"> 8% cases 41% cases 28% cases 23% cases | <ul style="list-style-type: none"> - Urethral dissection - Crural separation - Pubectomy - Re rooting | } | required for tension free anastomosis. |
|--|---|---|---|---|



❖ **Complication rates:**

	Stricture	ED	Incontinence
Primary re-alignment	50-60%	30%	
Immediate surgery	50%	50%	20%
Delayed repair	100%	20%	Nil < 3%

❖ Various methods for primary re-alignments:

1. PUC if possible
2. Endoscopic re-alignment
3. Rail roading of sound boogies
4. Catheter traction to pull prostate down – absolute now

❖ **If orthopedic hardware used for pelvic # stability:**

Put SPC high up and then tunnel through skin.

Keep away from pubis.

No increase infection in implant.

Q: what is PFUDD?

A: Pelvic fracture urethral distraction defect (PFUDD)

Q: why posterior urethral strictures are known as defects?

A: Following a pelvic bone fracture with the destruction of posterior urethral continuity, a surrounding hematoma-fibrosis complex is formed between the two urethral ends. Therefore, instead of “stricture,” the term of “defect” is usually used for the posterior urethra

Q: What is the m/c cause of PFUDD?

A:

- Vehicular accidents
- Falls
- Industrial accident

Q: which pelvic fractures are associated with PFUDD?

A:

- Fracture of anterior pelvic ring
- Pubic diastasis
- Straddle fracture
- # resulting in both vertical & rotational pelvic instability

Q: what % of pelvic # will have urethral injuries?

A: 10%

Q: When can Pubic diastasis occur naturally?

A: In female – Pregnancy

In male → never

Q: How are pelvic fractures classified?

A:

- Tile’s classification system based on stability of pelvic rim
- Young’s classification based on type of compression causing pelvic fracture.

Q: what is open book fracture?

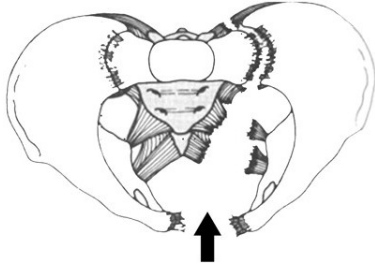
A: Caused by A-P Compression (type II)

Diastasis of pubic symphysis

+

Disruption of ipsilateral S.I. Joint

= open Book #



Q: What is Malgaigne's #?

A: Vertical Shear #

Ipsilateral # of both Pubic rami → superior & inferior

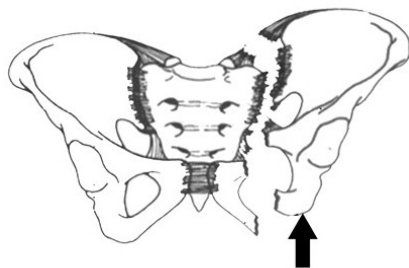
= Malgaigne's #

Ipsilateral # of S.I joint

Vertically two different levels of hemi pelvis

+

+

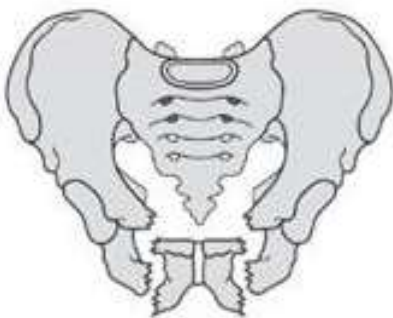


Q: what is Butterfly #?

A: also known as Straddle #

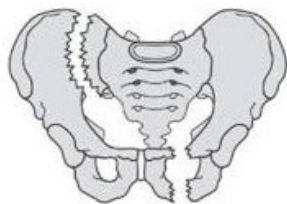
A.P compression injury

Involves the # of bilateral superior & inferior pubic rami with x shaped pubic symphysis intact.



Q: what is Bucket handle #?

A: # of anterior arch & contralateral posterior arch.



Q: When will you guess that posterior urethral injury is there in a pt of pelvic #?

A: If there is pubic diastasis

If there is infro-medial pubic rami fracture.

Q: what is the level of urethral injury in PFUDD?

A:

- Classical Theory: Prostatic-Membranous junction is the level of urethral injury in PFUDD
- Revised theory: Bulbo- Membranous junction is the level of urethral injury in PFUDD

Q: can APU I occur in females also?

A: 5%, usually involving anterior wall of urethra along with vaginal laceration

Signs of urethral injury in females include:

- Vaginal bleeding or laceration (80%).
- Urethral bleeding.
- Haematuria.
- Labial swelling.
- Inability to void.

Q: What is the level of Acute posterior urethral injury (APU I) in children?

A;

- APUI Involves Bladder neck & Prostatic Urethra in children.
- PFUDD extend into Bldr neck because there is no prostate

Q: What are the concerns with PFUDD?

A:

- Bladder neck tear
- Incontinence
- Impotence

Q: What is the classical triad of urethral injury?

A: The classical triad of posterior urethral injury in males includes:

- Blood at the urethral meatus.
- Inability to void (or distended bladder).
- Pelvic fracture with pelvic haematoma.

Amongst these signs, the presence of blood at the urethral meatus is the most important .

Q: What will you see in perineal region?

A: Butterfly shaped perineal Hematoma.

Q: What is “pie in the sky” bladder?

A: When Bladder is pushed high up due to pelvic hematoma

Q: What is “pie in the sky” prostate?

A; When prostate is pulled high up due to detachment of Pubo prostatic ligaments in posterior urethral injuries

Q: What is the special Characteristic of female PFUDD?

A –

- May extend into Bldr neck
- Vulval hematoma
- Immediate Repair of all injuries

Q: How will you manage PFUDD in female?

A: Immediate repair (or atleast catheterization) because female urethra is short and if gets trapped into scar, later it is difficult to mobilize, so immediate repair of urethra with concomitant repair of vaginal injury.

Q: what is the basic investigation?

A: Retrograde Urethrogram

Q: how will you investigate in posterior Urethral injuries APUI in male?

A: do gravity RGU and place a SPC (safe option and gold standard.)

Q: How will you classify posterior urethral injuries?

A:

1. Colapinto and McCallum grading.
2. The American Association for Surgery and Trauma (AAST) grading

Q: what is Colapinto and McCallum grading of posterior urethral injuries?

A: Colapinto and McCallum grading.

Colapinto and McCallum grading emphasizes on the location of the injury in relation to the urogenital diaphragm in retrograde urethrogram. The original system described three types of urethral injuries.

- Type I—Urethral stretch injury
- Type II—Urethral disruption above / proximal to genitourinary diaphragm
- Type III—Urethral disruption both proximal and distal (both above and below) to urogenital diaphragm.

Goldman et al later revised this classification and added two more types of urethral injuries.

- Type IV—Bladder base injuries
- Type V—Straddle anterior urethral injuries.

Injury Type	Injury Description	Urethrographic Appearance
I	Stretching or elongation of the otherwise intact posterior urethra	Intact but stretched urethra
II	Urethral disruption above the urogenital diaphragm while the membranous segment remains intact	Contrast agent extravasation above the urogenital diaphragm only
III	Disruption of the membranous urethra, extending below the urogenital diaphragm and involving the anterior urethra	Contrast agent extravasation below the urogenital diaphragm, possibly extending to the pelvis or perineum; intact bladder neck
IV	Bladder neck injury extending into the proximal urethra	Extraperitoneal contrast agent extravasation; bladder neck disruption
IVa	Bladder base injury simulating a type IV injury	Periurethral contrast agent extravasation; bladder base disruption
V	Isolated anterior urethral injury	Contrast agent extravasation below the urogenital diaphragm, confined to the anterior urethra

Q: what is AAST grading system?

A: The American Association for Surgery and Trauma (AAST) grading:

The AAST grading emphasizes the degree of disruption and the degree of urethral separation. It divides urethral injuries into the following five types:

- Type I—Contusion
 - Type II—Stretch injury but no disruption of urethra
- Type III—Partial disruption of urethra
- Type IV—Complete disruption with urethral separation < 2 cm
- Type V—Complete disruption with urethral separation > 2 cm

Q: what is Pansadaro's classification of posterior urethral strictures?

A: Pansadaro's classification of posterior urethral strictures is provided here:

- Type I: Fibrous tissue involves the bladder neck only, termed “bladder neck contracture.”
- Type II: Stricture is localized to the median part of the prostatic fossa, with open bladder neck and spared Verumontanum.
- Type III: Complete prostatic urethral obliteration.

Some people believe that Pansadaro's classification is for post TURP stricture.

Q: when will you do immediate primary repair?

A: Main indications for primary repair are

- penetrating injuries like Gunshot injuries
- injuries of the bladder neck and prostate,
- injuries associated with perineal degloving and
- injuries associated with a rectal tear

Q: what would you do if it is a partial Tear?

A: deploy a 14 FCH Foleys, gently at the initial single attempt, over a guide wire under IITV guidance

Exam answerI will deploy a SPC (safe and defendable answer)

Q: What are the adv of endoscopic primary realignment?

A:

- Less callous
- Proper alignment

Q: How will you know it is partial /complete Tear?

A: On AUG if some amount of contrast reaches bladder → Partial Tear

If no contrast reaches bladder → Complete Tear

Q: describe the procedure of dynamic ascending urethrogram (in a stable patient)?

A: For urethrography of male patients, the external meatus is prepared in sterile fashion with the patient supine. Various devices may be used to instill the contrast agent: a specially designed clamp (eg, Knutsson or Brodney's), a 6–8-F Foley catheter with a 5-mL inflatable balloon, or a hysterosalpingographic catheter with a 3-mL balloon. When the catheter tip reaches the fossa navicularis, the balloon is inflated with 1–2 mL of saline solution. Anesthetic gel is not routinely used during catheter insertion because it increases the likelihood of catheter expulsion. Once the clamp or catheter has been inserted and the balloon is inflated, the fluoroscopic C-arm is rotated to a 30° left or right anterior oblique position or the patient is asked to elevate his left side to approximately the same angle. The oblique angle is essential to demonstrate the entirety of the urethra. For ascending urethrography, the penis is placed laterally over the thigh, and, while moderate traction is applied, 20–30 mL of an iodinated contrast agent is injected slowly via the catheter with fluoroscopic guidance. A slow rate of injection reduces the risk of extravasation. The

injection should continue until the contrast material is seen to flow past the external urethral sphincter and into the bladder. Image acquisition should be initiated at this stage. Often, a spasm of the external sphincter prevents filling of the membranous and prostatic urethra. If this occurs, gentle continuous positive pressure should be applied with injection via the catheter until the sphincter relaxes.

Q: Describe the rail road technique?

A: Instrument Davis male – female Bougie

Step

1. Open the Bladder
2. Female bougie from Bladder and male Bougie from urethra
3. Once engaged ; bring the joint bougies to bladder
4. Tie thread to male bougie
5. Out from urethra with thread
6. Tie Foleys to thread
7. Back to Bladder
8. Close Bladder +/- SPC
9. Thread Placed long over abdominal skin

Q: How will you preoperatively evaluate the patient undergoing delayed Reconstruction?

A:

- Do “up and down –o-gram”--.(Simultaneously VCUG + AUG)
- Do” Gapometry” – MRI

Q what is Gapometry?

A: Gapometry” – MRI is the calculation of urethral defect(gap) on MRI

Adv: Takes into consideration the bend of the urethra

Q: What is Gapometry index?

A:

$$G = \frac{\text{Gap (length of defect)}}{\text{Length of Bulbar urethra}}$$

Less than 0.35 is good,

In other words a gap which is 1/3rd of the total bulbar urethral length can be anastomosed directly, where as a gap of more than 1/3rd the bulbar length requires a progressive perineal urethroplasty.

Q: What is the other name for Gapometry index?

A: urethrometry index

Q: What is the need to take scout film in VCUG?

A: To see for

- Calculus
- status of fracture healing
- Any bony fragment lying near posterior urethra.

Q: what do you want to see in VCUG?

A:

- Bladder Neck status open or close



Diverticulae,

- stones (in bladder)
- Prostatic Urethra

Q: What is S-Bend displacement?

A: It is the posterior and sideways displacement of urethra due to callous/ hematoma.
S bend is best appreciated on reconstructed MRI images.

Q: what is beaked bladder neck?

A: on a static VCUG Cystogram, open bladder neck appearance is known as beaked bladder neck.

- It is quite common to see an apparently incompetent bladder neck in association with a complete obstruction but this is usually misleading. The reason for this appearance (of a so-called “beaked” bladder neck) is not clear, but the vast majority of such patients have a perfectly competent bladder neck postoperatively.
- When the bladder neck has been damaged, it produces an altogether different appearance; indeed, it looks as though it has been damaged rather than simply being beaked open.

Q: what are the options available for PFUDD delayed Mx?

A: Endoscopic Mx
Open Sx

Q: What is the status of endoscopic Mx?

A: endoscopic management is not used as a part of delayed management.
Some authors have described endoscopic ‘core through’ the callus but results are not good.

Q: What surgery is done for PFUDD?

A: End to end repair anastomosis

Q: what are the adjuvant maneuvers?

A;

- Corporeal splitting
- Inferior pubectomy
- Urethral re-routing

Q: In which age group (pediatric or adults) urethoplasty has Better results?

A: In adults, because, in children elasticity of urethra is less and length of bulbar urethra is more in adults

Q: what is the status of cold clammy penis as marker of vascular insufficiency of penis?

A: it is only in books, very rare to see practically.

Q: How will you do penile revascularization?

A: Anastomose inferior epigastric artery to dorsal penile artery.

Q: describe the history of posterior urethral anastomosis operation?

A:

- 1962 – Pierce –performed the “splendid” exposure of the posterior urethra by total abdominal pubectomy, but he later abandoned this approach because of postoperative problems and several failures.
- 1968 - Paine and Coombes - direct transpubic excision of the stricture associated with primary end-to-end anastomosis of the urethral ends, using a single abdominal incision.

- 1973 – Waterhouse - perineal incision for mobilization of the anterior urethra and an abdominal incision for transpubic anastomosis between the bulbar urethra and the prostatic apex.
- 1976 - Turner-Warwick omental wrap to provide vascular and trophic support to the transpubic bulboprostatic anastomosis.
- In the 1970s and into the 1980s, the perineal-abdominal transpubic urethroplasty was considered the gold standard in the majority of adults and children suffering from PFUDDs showing traumatic strictures that Turner-Warwick described as complex.
- In 1983, Webster and Raman popularized an elaborated perineal approach for the reconstruction of pelvic fracture related urethral distraction injury in which urethral mobilization is augmented by progressing through additional steps of corporal splitting, inferior pubectomy and supracrural urethral rerouting, as needed, to bridge long or complex urethral defect.

Q: what are the repairs you know for PFUDD?

A:

- Webster's progressive perineal uretheroplasty PPUx
- Waterhouse's abdominal uretheroplasty

Q: what do you mean by progressive perineal uretheroplasty PPUx?

A:

- Most posterior urethral distraction defects are short and usually resolved by a perineal approach anastomotic repair.
- However, a 'perineal progressive approach' is required when the Prostato-bulbar gap is longer than 2–3 cm due to a high dislocation of the prostate or when the mobilized urethra is too short because of damage during a previous surgical procedure.
- The progressive approach involves a series of maneuvers to produce sufficient anterior urethral mobility to bridge up to 8 cm of separation

Q: what are the progressive steps in progressive perineal uretheroplasty PPUx ?

A: the progressive steps are

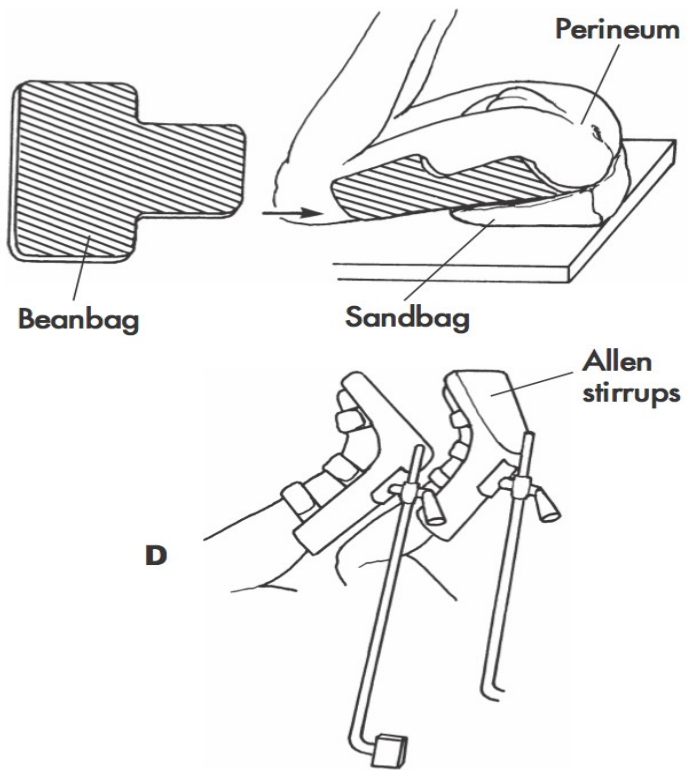
1. Complete bulbar urethral mobilization
2. corporal separation
3. inferior pubectomy
4. rerouting of urethra around the corpora cavernosa

Q: what are the accessories used for patient positioning for PPUx?

A:

1. Allen stirrups
2. Sand bag or a rolled towel
3. Bean bag (optional)

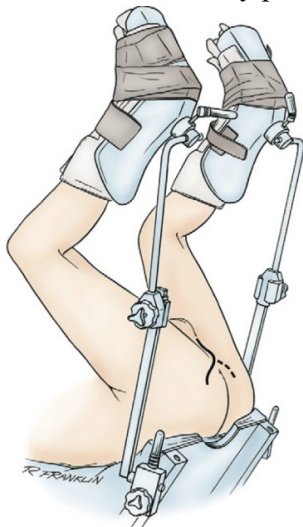
Exaggerated Lithotomy Position



:

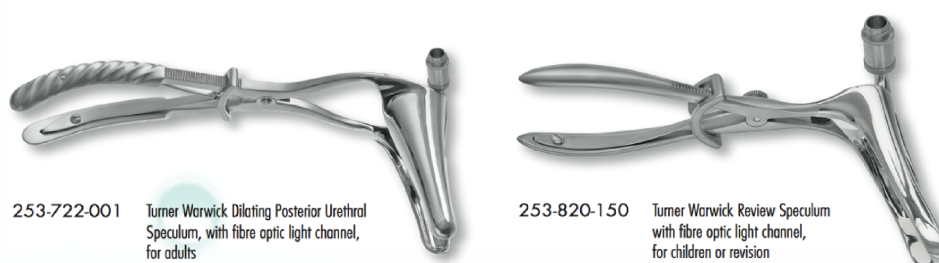
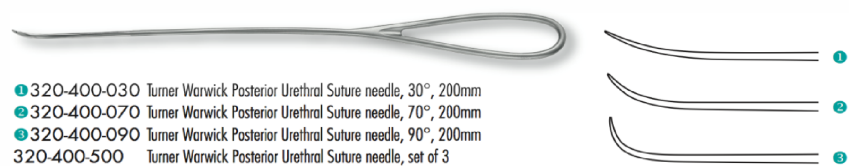
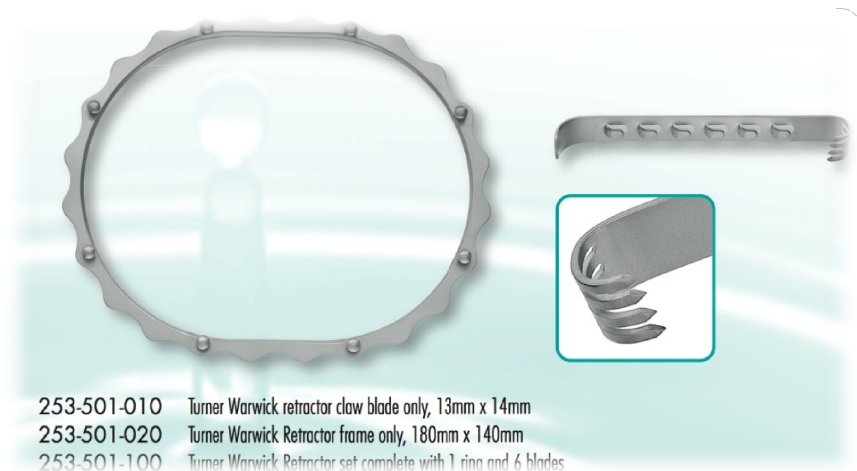
Q: describe the position for PPUx?

A : extended lithotomy position



Q: what are the special instruments needed for PPUx ?

A:



Q: How will you proceed for PFUDD PPUx?

A:

1. Get orthopedic clearance for extended lithotomy position
2. Consent – Explain

- route of surgery
- impotence / E.D
- Incontinence
- Restenosis
- Infection
- Bleeding Trauma

3. Injⁿ T.T. & Proctoclysis .enema on previous night
4. Local Part Preparation with perineal preparation
5. Morning dose antibiotics
6. Ted Stockings & shift to theatre

Anesthesia - G/A



Position:

- Exaggerated lithotomy position
- Legs placed in guardian stirrups or Allen stirrups
- Buttocks 2 inches hanging from table edge
- Do formal Urethroscope

Incision:

- vertical midline perineal incision
- Skin & subcutaneous tissue cut
- The first step of the procedure is circumferential mobilization of the bulbar urethra as far proximally as the obliterated segment
- Dissect the Bulbo spongiosus in midline and hook around the corpus spongiosum .
- Apply Turner-Warwick perineal retractor
- Free the Bulbo spongiosus from the perineal body and lift it away
- Pass a Foleys catheter through meatus and estimate the penile end; Transect the urethra at this level .The proximal urethra is transected at the point of obliteration, and the urethra is then mobilized distally to a few centimeters distal to the crus
- The corpus spongiosum is detached from underlying triangular ligament & corp. cavernosa
- Divide the triangular ligament & develop the intra – crural space
- Deep dorsal vein if encountered is ligated & cut
- Haygroove staff is then introduced into the supra pubic tract, through bladder neck and then into posterior urethra
- Impulse of Haygroove is palpated and all fibrous tissue resected until normal planes reached .
- If the stricture is short and pelvic floor fibrosis minimal, the tip of the sound can be palpated easily in the dissection in the perineum. In these circumstances a one-stage perineal anastomosis can usually be assured
- The tip of Haygroove staff dilator is eventually delivered into perineal wound and 2 stay stitches taken on prostatic urethra.
- Cystoscopy is done to confirm the post urethra , Bladder neck .
- SPC deployed under vision
- The length & alignment of anastomosis is judged. Further circumferential mobilization of the distal urethra as far as the suspensory ligament of the penis. To prevent chordee, the dissection should not extend beyond the ligament, which can be incised to facilitate urethral elongation.
- After this mobilization, the healthy adult urethra can be stretched as much as 2 to 3 cm, which proves sufficient for anastomosis
- Proximal urethra is calibrated upto 32 FCH
- Prostatic Urethra Spatulated @ 12 o'clock
- Ant. Urethra spatulated @ 6 o'clock
- Anterior urethral Mucosa tacked
- All 12, 2,4, 6, 8,10 interment sutures taken
- Posterior wall closed → prostatic end—outside in , → penile end – inside out
- Silicon Foleys deployed 18 Fch
- Ant. Urethral Wall closed
- Drain deployed deep to Bulbospongiosus
- Bulbo spongiosus closed
- Drain deployed over Bulbospongiosus
- Closure done
- Compressing dressing done
- Foleys strapped to abd wall.

Q: How will you manage Post op Period?

A: same as Russell's E-E urethreroplasty

- Bed rest 48 hrs
- Tolterodine in post op period
- 21st day foleys removal & VCUG
- If no leak then SPC clamp
- SPC removal After 7 days

Q: what is the success rate of PPUx?

A: >90%

Q: What are the components of progressive perineal urethreroplasty?

A:

1. Circumferential Bulbar Urethra mobilization 3 cm gain
2. Crural separation 2 cm gain
3. Inferior Pubectomy 2 cm gain
4. Corporal re-routing 2cm gain

Q: what are the additional steps in progressive perineal urethreroplasty?

A:

- Separation of the proximal 4 to 5 cm of the corporal bodies beginning at the level of the crus distally, dissecting in the relatively blood- less plane between them
- The urethra can be laid between the separated corporal bodies, which can shorten the distance for anastomosis by 1 to 2 cm and is sufficient for anastomosis in 41% of cases
- A 1.5 to 2 cm wide wedge of bone can be excised from the inferior surface of the pubis exposed by corporal separation
- Routing the mobilized urethra between the separated corpora and through the bony defect will further shorten the distance to the prostatic urethra by 1 to 2 cm and facilitates anastomosis in 28% of cases.
- If the urethra still appears to be too short after the three previous maneuvers, the urethra can be re-routed around the lateral surface of a corporal body
- It is necessary to create a tunnel in the bone beneath the corporal body and communicate this with the tunnel created by inferior pubectomy.
- The urethra is then laid in this pathway, re-routing it around the corporal body, which shortens the distance to the anastomosis by 1 to 2 cm.
- This is usually sufficient for the final 23% of cases

Q: where will you divide Bulbo-spongiosus?

A: in midline

It may be dropped / pulled down in 1st time opⁿ pt. (fresh pt)

Q: How can you locate the post urethra from upper side?

A ;

- Pass a Haygroove sound & palpate
- Use a flexible cystoscope & lower lights
- Pass an infant feeding tube, inject dye
- Open the Bladder & see the neck

Q: How will you ensure that Haygroove staff dilator will go in Bladder neck?

A: Keep in midline plane, follow the curve gently
Put a finger in rectum and guide the dilator

Q: What is the side effect of urethral re-routing?

A: difficult future cystoscopy

Q: what do you want to save while removing callus/ fibrosis/ corporeal separating?

A: Avoid injury to cavernosal nerves
Use subperiosteal plane for dissection (please check this answer)

Q: What is triangular ligament?

A: triangular ligament is the ligament between the two corpora cavernosa, as the two corpora separate and move towards ischial rami for insertion

Triangular ligament in the fibrous component of tunica albuginea

Q: what are the different types of pubectomies?

A:

- superior pubectomy
- Inferior pubectomy
- Complete trans pubectomy

Q: what is the incision for transpubic approach?

A: vertical midline upto base of penis

Q: How will you cut pubic symphysis?

A: 1 cm on each side of midline symphysis , thus a 2 cm piece is removed

Q: How will you gain more length even after pubic symphysis excision?

A: Remove the fibrosis callous from underneath the bladder & prostate

Q: what is the length/height of Symphysis pubis?

A: 2 inches (cranio-caudal length)

Q: what is superior pubectomy?

A: In superior pubectomy, about 1.5×0.5 inch of bone is resected along with the arcuate ligament. This provides an excellent exposure for a tension-free bulboprostatic anastomosis. The preference for the superior pubectomy is that it greatly facilitates exposure of the normal urethra proximal to the injury site and thereby downward mobilization of the superiorly displaced prostate. This approach helps in managing the associated adverse events, such as the fistulous communication to the surrounding organs and bladder neck incompetence at the same time

Q: what is inferior pubectomy?

A: in inferior pubectomy, the inferior margin of pubic symphysis is resected.
This is 3rd step in Webster's progressive perineal urethroplasty.

Q: where will you spatulate the urethral ends?

A prostatic end @ 12 o' clock
Bulbar end @ 6-o 'clock

Q: How will you anastomose the urethral ends?

A: Prostatic end → 12 o'clock spatulation → anterior capsulotomy of prostate → put stay sutures → Calibrate upto 32 fch --. Secure the apex → fix the mucosa; tack the urethral ends with 4-0 vicryl so the mucosa does not retract →. Anastomosis posterior layer → deploy silicon catheter → anastomose anterior layer → Drain → perineal region closure → SPC

Q: How will you fl/up?

A:

- drain removal on 3rd POD
- Foley removal @ 6 weeks & clamp SPC (some centers do MCU at this day to check leak)
- SPC removal after 1 week of Foleys removal (after ensuring that pt. is now voiding well)

Q: what is Koraitim's Triad?

A: It is a triad for successful outcome after doing PPU

- Complete callus excision
- Mucosa to Mucosa approximation
- Tension free anastomosis

Q: What are lengths gained in different steps of PPU?

A: Circumferential Bulbar urethral mobilization = 2.5 – 3 cm

Crural Separation = 1-2 cm, Corporal rerouting = 2 cm

Q: what are the chances of ED after PFUDD repair?

A: 12-52%

Antegrade ejaculation is preserved in most cases

Type of urethroplasty has no significant effect.

Q: what is Waterhouse's urethroplasty?

A :

- it is a combined perineal and abdominal approach
- Perineal incision for mobilization of the anterior urethra and an abdominal incision for transpubic anastomosis between the bulbar urethra and the prostatic apex.
- Around 2 cm segment of pubic symphysis is removed completely.

Q what is Mathur's urethroplasty?

A: Mathur *et al.* have described a novel technique of "U" shaped anastomosis between the bulbar urethra and the prostatic apex. After the strictured segment is excised, the sutures are taken between both the urethral ends sparing the region extending between 10 o'clock to 2 o'clock positions. The authors propose that this technique has lesser restenosis rates as the urethral blood supply is not hampered.

Q: What is ileal urethroplasty?

A: Placing a pedicled ileal refashioned flap in between the two distracted urethral ends

Q: what is PAPA?

A: Perineo-Abdominal Progression-Approach (PAPA)

Readers are requested to visit <http://www.strictureurethra.com/urethroplasty/anastomotic-urethroplasty-membranous-urethra.html>

Q: What is gracilis muscle flap combo?

A: for restenosed / Re-do operations

- Gracilis muscle will make the Bed
- Do BMG over Gracilis formed Bed

8

Undescended Testis

Q. What is **normal scrotal position of testis**?

Ans. When point of testis is at or below the mid point of at (or below) the mid scrotum.

Q. What is **high scrotal testis**?

Ans. When midpoint of testis is higher than mid scrotum.

Gliding Testis:

Testis that can be manipulated in scrotum but reflects immediately on release of tension

Undescended Testis: crypto orchid

Absence of testis in its normal scrotal position

Vanishing Testis:

A testis which was present initially in the development but got lost owing to some vascular accident / torsion

Agenesis:

A testis which was never present (generated)

Congenital cryptoichidism:

Testis that is non-scrotal since birth

Recurrent Cryptoichidism/ Testicular Ascent /Aquired cryptoichidism:

Testis which is scrotal at birth, but subsequently became non-scrotals.

Q. What is **retractile testis**?

These are scrotal testis that retract easily out of scrotum but can be manually placed back in scrotum and remain there temporarily (at least 1 min)

Q. What is the incidence of Cryptoichidism?

Ans. 3% in full term
30% in pre term
1% at under year of age

Q. What are the types of undescended testis?

Ans. Non syndromic }
Syndromic } Non syndromic: Syndromic \equiv 6:1

Q. What are the prenatal risks factors a/w Cryptoichidism?

Ans. Pre Maturity
LBW / small for gestatimal age



Breach presentation
Material DM

1. Pre term delivery
2. Breach presentation
3. FTND treat LBW
4. Maternal DM

Q. What are the chances of spontaneous descent after birth?

Ans. 70% of testis descended spontaneous at 3 months
90% of testis descended spontaneous at 6 months

After 6 month very rare chance of spontaneous descent

Q. What is the difference between retractile testis & gliding testis?

Ans. On releasing tension, gliding testis immediately recoils back in inguinal canal.
HPE abnormal in gliding testis.

Q. What are factors affecting spontaneous descent after birth?

Ans. Birth Weight
Pre term
Bilateral Cryptoichidism
Position of Cryptoichidism testis
Scrotal anatomy and configuration

Q. What are the characteristic of acquired Cryptoichidism?

Ans. late presentation at 8-9 year of age
Low lying testicular position
Presence of fibrous remnant of the processus vaginalis which foreshortens the cord

Q. For how long the retractile testis needs to be follow up?

Ans. preferably upto puberty. 5-10 % of retractile testis will become undescended testis by puberty.

Q. What are the relative risk ratio of Cryptoichidism in family?

Ans. For twins RR is 10 times
For brother is 5 times
For father-son is 2.5 times

Q. What are the genetic cause for Cryptoichidism

Ans. Defective:
INSL – 3
HOX – A genes
SF – 1 genes

Q. What is testicular dysgenesis syndrome (TDS)?

Ans. A constellation of reproductive abnormal including:

Testicular cancer
Hypospadias
Reduced sperm count
Crypto orchidism

} Associated with exposure to anti androgens / estrogenic environment

Q. Who described testicular dysgenesis syndrome (TDS)?

Ans. Skakkebaek, testicular dysgenesis syndrome is different from testicular regression syndrome (TRS).



Q. What is EDCs ?

Ans EDCs are endocrine disrupting chemicals they dysregulate the HPA axis
e.g. DES – Di Ethyl Stilbestrol
Pesticides
Flam retardants

Q. What is the probable endocrine hormonal condition in a child of crypto testis?

Ans A subset 20% will have measurable abnormal in pituitary gonadal hormonal secretion in HPA axis.

Q. What is emergent testis and infropubic testis ?

Ans Emergent testis: Just emerging from “SIR”- Suprapubic testis
Infrepubic testis: below the level of pubic symphysis

Q. What are the syndromes associated with crypto?

Ans Kline felter (KIDS WT
Down syndrome Kids without testis)
Prune Belly syndrome
Spigleau hernia
Tracheo-esophagela abnormal syndrome
Myelo meningocele,
Spina bifida → due to GFN transaction
Imperforate anus
PUV
WAGR → after wilms + undescended testis

Q. In which position will you examine the child?

Ans **Supine**
Upright cross legged (Best) → relaxes the abdomen and cremasteric muscles
Abduction of thighs leads to inhibition of cremasteric reflex which leads to upward position of testis.
Standing

Q. What precautions will you take while examining the child?

Ans: Warm room
In mother's presence / stand by / repeated examination
Warm hands
Liquid soap in examiners hand

Q. what is the statistical data on crypto?

Ans 80% of crypto are palpable (clinically)
70% are unilateral
30% are bilateral.
Among 20% of non palpable 50% are peeping testis. 20% are absent and 30% are atrophied.

Position wise

Abdominal – 34%

Piping – 12%

Canelicular – 27

Beyond external ring – 27%

Q. what will you look after local examination?

Ans Ipsi lateral side testis – palpability, mobility, side, site, shape firmness
Contralateral testis

Associated hernia, hydrocele
Penile length, hypospadias, penile size
Secondary appearance
Urethral orifice, meatus

Q. What is **testicular regression syndrome**?

Ans Due to bilateral vanishing testis – low serum testosterone
small penile size, features of hypogonadism, gynecomastia in adult

Q. What is ectopic testis?

Ans When testis is not in its usual path way of descent

Q. What is most common the ectopic location of testis?

Ans 1. Superficial inguinal pouch (anterior to rectus abdominal muscle)

Most common

Also known as Dennis Browne Pouch

2. Femoral

3. Pubic

4. Transverse scrotum

5. Perineum

Q. What is the cause of vanishing testis?

Ans Torsion or vanishing accident occurring after completion of genital masculinization but before fixation of the testis in the scrotum

Evidence supporting - Presence of hemosiderin in ipsilateral rubbing

Contralateral testicular post natal torsion

Q. What will be the most likely local examination findings s/o vanishing testis in a case of crypto?

Ans (1) Contralateral enlarged testis

(2) Absence of scrotal nubbing

Final diagnosis made by blind ending spermatic vessels

Q. What are the indication for doing USG in NPT (non palpable testis)?

Ans Obese patient

Unco-operative patient

Suspected DSD

When body habits prevents proper examination

Q. What are the indications for doing MRI?

Ans Indication of ectopic abdominal testis not localized laparoscopy.

Q. What are the associated pathological of testis epididymis associated with NPT/ Crypto?

Ans Testicular maldevelopment

Q. what are the testicular mal development findings?

Ans number of spermatogonia per seminiferous tubule is maintained upto infancy and starts reducing after age of one year and then reduces exponentially after one year – peritubular fibrosis occurs. After 3 year decrease Leydig cells, decrease Sertoli cells and decrease germ cells.

The contra lateral testis is also affected but to lesser degree.

Q. What is the incidence of germ cell aplasia in cryptorchidism according to age?

Ans < 1 year - 0.5%

1 year - 2%

2 year	-	20%
6 year	-	40%
12 year	-	45%

Q. What are the chances of abnormal histology in contra lateral testis?

Ans 20-50% (2 times R.R. for Ca testis in contra lateral testis)

Q. What exactly happens in NPT w.r.t. fertility?

Ans Disruption of pre pubertal sertoli cells
Failure of maturation of sertoli cells in number
Impaired transformation of gonocytes to spermatogonia

Q. At what stage of the spermatogenesis is arrested?

Ans Differentiation of primary gonocytes to ad spermatogonia does not occur

Q. What is the effect of NPT on testicular growth?

Ans At birth both testis are equal.
NPT grows slow and thus lag behind the development and thus the testis in size
Orchiopexy before 1 year → partial catch up with growth
Orchiopexy after 3 year → does not grow significantly after orchiopexy.

Q. What are the epididymal abnormalities in crypto?

Ans Anomalies of fusion b/w caput & cauda epididymis
Failure of elongation / looping of epididymis
Epididymis arteria
Upto 90% cases of UDT have epididymal abnormalities.

Q. What are the concerns with crypto?

Ans Risk of subfertility
Risk of malignancy
Risk of Torsion

Q. What are the chances of torsion in NPT?

Ans Very high chances due to
Patent process vaginalis
Abnormal attachment of gubernaculum

Q. What is the fertility status of NPT patient?

Ans For unilateral undescended testis - Fertility rates are lower than control population
But Paternity rates are equal to control population.
For bilateral undescended testis - Both fertility rates and paternity rates are lower than normal

Q. Why NPT patient has **subfertility**?

Ans: Decrease number of spermatogonia per tubule (S/T)
Arrest of spermatogenesis at ad spermatogonia stage
Decrease number of sertoli cells
Defective maturation of spermatogonium
All these lead to oligospermia, asthenospermia head & tail defect, motion defects etc of variable degree.

Q. How does undescended testis lead to **malignancy**?

Ans undescended testis have arrested growth of primary gonocytes. These arrested primary gonocytes → *ITGCN* → *GCT* → $\frac{\text{Seminoma}}{\text{NSGCT}}$

- Q. What is the relative risk of malignancy in NPT?
 Ans 4-6 times in NPT / undescended testis
 2-3 times in boys undergoing prepubertal orchiopexy
 1-2 times in contra lateral testis
- Q. What % of GCT patients have history of crypto?
 Ans 10%
- Q. What is the incidence of ITGCN in NPT?
 Ans 0-5%
- Q. What is the relative risk of getting GCT in contra lateral testis?
 Ans RR – 1.5-2.0 tiems
- Q. What type of GCT, develop in undescended testis (UT)?
 Ans In persistant UT → Seminoma
 In Orchidopexy scrotally fixed testis → NSGCT Embryonal
- Q. What is the role of testicular biopsy in patient with UT?
 Ans Role of testicular biopsy is not clearly defined
 a. In patient who are undergoing orchiopexy post puberty
 b. Those with chromosomal defects
 c. Family history of Ca testis
- Q. What is the testicular microlithiasis?
 Ans These are multiple spectral calcifications within the testicular parenchyma
 2% chance of testicular tumour in microlithiasis
 Risk of GCT increase with crypto + microlithiasis
- Q. How will you prevent cremaetric reflex during physical examination?
 Ans Cross leg position
 Pressure on femoral artery
 Pressure on pubic symphysis
- Q. What history is important when evaluating a patient with UDT ?
 Ans Maternal treatment with steroid antenatally
 Birth history of UDT
 Family history of UDT
 Previous groin surgery
- Q. What are the goals of orchiopexy done at 6 months of age?
 Ans Optimize testicular function
 Potentially reduce the chances of malignancy
 Facilitate early detection of malignancy
 Cosmetic benefit
 Prevent torsion / Clinical hernia
- Q. **When will you offer observation therapy?**
 Ans **Age less than 6 months**
Age more than 50 years
Retractile testis
- Q. What is the timing to operate orchidopexy?
 Ans From age 6 months to 1 year (ideal time)

- Q. What will you do for cases of acquired crypto?
 Ans Do not offer observation treatment
 Surgically fix them
- Q. What is the role of medical therapy in management of UT?
 Ans No established role
 Very low success rate $\leq 20\%$
 Rarely given / recommended now a days
 Success only for extra canicular testis / high scrotal testis
- Q. What is the hormonal therapy protocol?
 Ans (1500-2000 HCG units) x 4 doses over a period of 3 weeks
 Total does 6000-8000 units HCG (IM)
 + GnRH nasal spray 0.4mg/tds (total dose 1.2 mg/day) for 4 weeks nasal spray
- Q. what are the disadvantages of hormonal therapy?
 Ans Very low success rate
 Results good in low lying testis
 May harm future spermatogenesis; through increased apoptosis of germ cell and inflammatory changes.
- Q. What is the **NORDIC** consensus statement?
 Ans Nordic consensus statements on NPT
 Do not recommend hormonal management.
 Do not recommend testicular biopsy.
- Q. What will you do for a palpable testis and when ?
 Ans Inguinal (schoemaker) orchiopexy \pm hernia repair of present age 6-12 months ideal
 Or any time at presentation (till puberty)
 Orchidectomy after puberty

Inguinal Orchidopexy (Petrivasky / schoemaker option)

Introduction: Palpable undescended inguinal / high scrotal testis

Age: Minimum 6 months

Anesthesia: General Anesthesia

Position: Frog leg position

Painting & Draping: Keep umbilicus exposed
 Keep scrotum exposed (both sides)

Incision: Low transverse incision in Langer's line at inguinal crease, superolateral to pubic tubercle 3-4 cm in length

Procedure:

- i. Cut the skin
- ii. Search for testis in subcut fat
- iii. Expose the ext. oblique aponeurosis (EOA)
- iv. Palpate again for testis
- v. Make a nick on ext. obl. Aponeurosis away from palpable testis
- vi. Open EOA; save ilio inguinal nerve
- vii. Dissect the tissues distal to testis; dissect off the gubernaculum & excise it.
- viii. Longitudinal incision on int. spermatic fascia
- ix. Dissect & ligate the hernia sac.
- x. Incise the transversalis fascia at DIR to allow retroperitoneal mobilization of cord
- xi. Peel off the cremasteric fascis.

- xii. Hold the tunica vaginalis edges to manipulate and handle the testis. Excise testicular appendages if present. (fix the testis)
- xiii. Pass index finger into scrotum from above
- xiv. Make a 2cm incision with scalpel transversely over scrotal skin
- xv. Separate the underlying dartos using mosquito forceps / scissors – make dartos pouch
- xvi. Make a nick in dartos
Take a forceps – enter from below (the dartos) – hold the testis and draw it out through scrotal incision
- xvii. Close the dartos behind
- xviii. Place testis in dartos pouch
- xix. Close skin
- xx. Close the inguinal incision layer wise.

Q. What is the name subdartos pouch?

Ans **Ritchey Bloom pouch**

Q. What is PRINTISS manœuvre?

Ans Medialisation of testis beneath the epigastric vessel.

Q. If the testis is not able to reach to scrotum then what are the ways / manœuvre to gain the length of cord

Progressive inguinal orchidopexy

- Step-1: Lateral incision of internal spermatic fascia (same as transversalis fascia) at DIR which allows for retroperitoneal mobilization of cord, vas and vessels.
- Step-2 Transection of lateral fascial bands along the cord and cranial retroperitoneal dissection cranial retroperitoneal dissection.
- Step-3 Medial transposition of testis beneath the epigastric vessels.
(PRINTISS manœuvre)

Q. What is **DESSANTI'S technique**?

Ans It is a two stage inguinal orchidopexy technique for high crural / low abdominal testis

- Stage-1 Involves placement of a PTFE membrane around the mobilized cord and fixation of testis to the invaginated scrotum with pledget.
- Stage-2 After 9-12 month delay
→ Re-exploration and definitive orchidopexy.

This technique is almost same as **PERLSKY ALBERT** option but in perlsky albert mobilized testis is fixed to perostium over pubic bone.

Q. What are post op complications?

Ans

- a. Bleeding
- b. Haematuria
- c. Hydrocele
- d. Injury to vas, artery, ilio inguinal nerve
- e. Twisting of cord
- f. Testicular atrophy
- g. Retraction of testis

Q. How will you follow up for 6 months?

Ans

- a. One monthly follow up for 6 months.
- b. Physical examination of scrotum.
- c. Teach self examination.
- d. Teach the parents for examination.
- e. Later call at puberty to explain fertility issues.

Q. When will you deploy testicular prosthesis?

Ans. Either at the time of initial operation (in post puberty age group)

Or at least after 6 months of previous surgery or at puberty

Use inguinal approach and close the scrotal fascia using purse string to retain prosthesis in scrotum.

Q. What is secondary orchidopexy?

Ans When a re-orchidopexy operation is done after failure of primary orchidopexy surgery.

Q. What is **REDMAN'S TECHNIQUE**?

Ans. "Lateral approach to cord" in secondary orchidopexy because blood supply is mainly from medially.

Q. What is the other approach to palpable testis?

Ans Scrotal orchidopexy (**BIANCHI'S OPERATION**)

Q. How many sections have to be studied if biopsy is done from the testis at the orchidopexy?

Ans. Minimum 100 sections

Q. **What are the drawbacks of testicular biopsy at the time of orchidopexy?**

Ans

- a. Specimen may not reflect picture of whole testis
- b. Fertility potential may be affected by post orchidopexy position
- c. Fear of anti-sperm antibodies
- d. Post orchidopexy atrophy occurs in 1.5%.
- e. Vas obstruction can not be detected by biopsy

Q. What is the composition of **BOUIN's solution**?

Ans

- a. Picric acid 1%
 - b. Acetic acid 5%
 - c. Formalin 9.5%
 - d. Water 84.5%
- Yellow colour, formaldehyde smell
ZENKER solution can also be used

Q. In case of bilateral UDT which side will you operate first?

Ans : The more distal one.

Q. **What is the drawback of a short VD?**

Ans mobilization of testis to scrotum (orchidopexy) will cause excessive tension on VD leading to

- a. Ureteric compression by VAS
- b. Ischaemic necrosis of testis if Fowler Stage II is done
- c. Fowler stage II is better avoided in these patients.

Q. what are the Indications for placement of transparenchymal suture during orchidopexy?

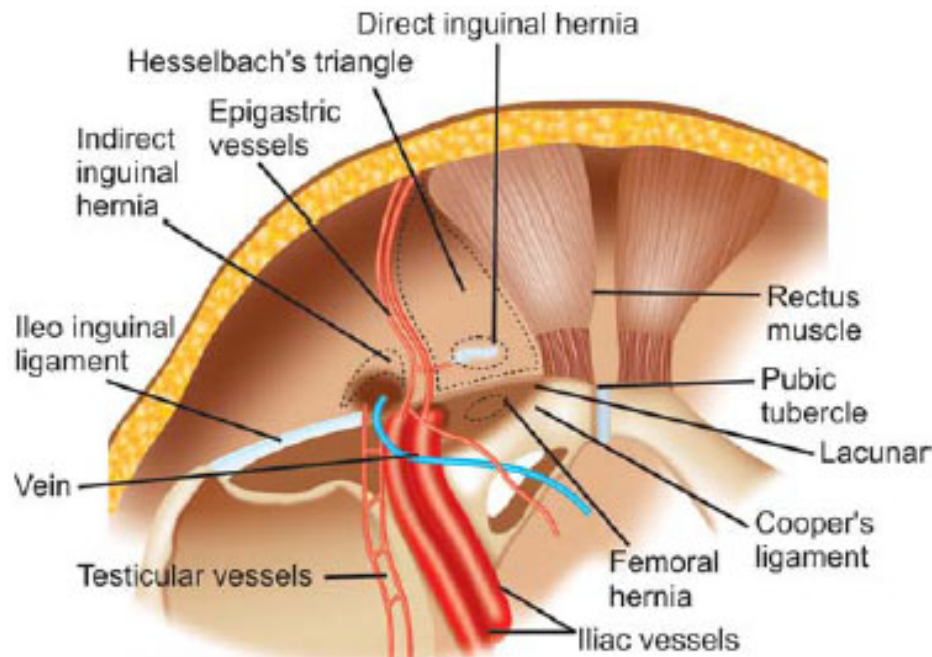
Ans

- a. Transparechymal suturing should always be avoided
- b. Ind_n where it can be done are
 - i. Tethered testis when its position is tenuous even after complete mobilization of cord and an external scrotal button fixation is needed.
 - ii. For testicular fixation of ipsilateral and contra lateral testis after testicular torsion.

Q. Which is better long loop VAS or short loop VAS?

Ans Long loop vas is better

- More length to mobilize testis to scrotum
- More number of collaterals between loop and testis
- Staged orchidopexy can be done only in cases of long loop vas



Laparoscopic view of left sided inguinal region

Management of non palpable abdominal testis (NPAT)

Q. What are the options for management of NPAT?

Ans Orchidectomy (post puberty)

Orchidopexy

Open – Single stage

Laparoscopic – Double stage

Observation (after 50-60 years)

Q. What are the Ind_n for orchiectomy ?

Ans Age – post pubertal (EAU guideline > 10 years – do orchidectomy)

Contractual testis – Enlarged

Ipsilateral testis – Small, flappy, dysgenetic, scrotal rubbing

Q. What is the standard of care / management in NPT / UT ?

Ans Diagnostic laparoscopic + Lap. Orchidopexy

Q. What are the layers of spermatic cord?

Ans As the vas & spermatic vessels travels out of perperitoneal space & pierce transversalis foscia; continued layer of transvers fascia is called internal spermatic foscia.

Next the internal oblique aponeurosis fascia continuous over the cord as cremastic foscia and muscle.

As the cord crosses SIR → ext. oblique Aponeurosis fascia extends over as external oblique fascia.

Thus in the inguinal canal, cord has two layers:

- Int. spermatic fascia
- Cremastic fascia

Out of the inguinal canal (in scrotum) canal has 3 layers (exte. Spermatic foscia added)

Ind_n: Abdominal (NPAT) viable testis – No scrotal nubbing C/I testis – normal

Age : ≥ 6 months

Anesthesia: G/A

Position: Supine with frog legged position

Insert a holled towel under lower back to create lordosis

Display folyes 8 fr. / infant feeding tube

Deploy RT

surgeon stands on opposite side of NPAT

Procedure:

G/A, painting & draping

Scrotum left exposed

Veries needle pneutmo peritoneum

1st 5mm/10mm comera port deployed just above

Umbilicus

- Prevent damage to bladder

Look with 30o telescope

Identify median umbilical ligament & medical umbilical ligaments

The filed of interest lies lateral to the medical umbilical ligaments

Vas deference in seen running form bladder to DIR. Crosses the medical ligament and is seen ascending towards DIR where it takes a sharp medical trun and courses in inguinal canal

In cases of NPAT, this anatomical path way of vas is not seen.

Only in cases of canalicular testis, the vas enters DIR.

Spermatic vessels are seen directly climbing up towards DIR.

EIA & EIV are usually not seen; until the posterior leaf of peritoneum is opened

Inferior enpgastric vessels are seen originating from EIA anterior and running just medical to DIR to further climb up towards. Ant. Abd. Wall (to anstomose at umbilicus with superior epigastic)

Examine both the DIR carefully and see for hernial sac, reduce the contents of hernia sac.

Identify the testis and locate it.

Mobilize the peritoneum starting 1cm supero-medical to DIR, curve around DIR and continue to raise that flap along 1cm lateral to the spermatic vessels.

This releases the spermatic vessels & vas on a common leaf (posterior peritoneum) of peritoneum. This leaf is mobilized from laterally to medically.

Gubernaculum is dissected as distally are possible and cut.

Testis is held with gubernaculum and pulled upto controlateral DIR. If it reaches contralateral DIR, it will also reach ipsilateral scrotum.

From inside out a trocar is pushed medial to inf. Epigastric vessels, passing ventral to pubic bone and inguinal ligament, entering the ipsilateral scrotum and exiting through skin.

A long curved artery forceps is rail roaded inside; testis grasped and pulled out of scrotum.

A subdartos pouch is made and testis fixed

Intra peritoneal bleeding and hemostasis checked

DIR is closed with peritoneal flap advancement

Ports removed and closure done

Follow up: is same as for std. inguinal orchidopexy

1 monthly follow up for 6 months

Fertility advise at puberty

Fowler Stephens Staged Orchidopexy

Introduction: Long looping vas deference

Lack of mobility of testis within abdomen

Staged orchidopexy can be done only in long looped vas patients

Positon:	}	Same, foley & RT
Anesthesia:		
Port Insertion		

First Stage:

1. After pneumo peritoneum & port placement search for the testis.
2. Once the testis is localized, grasp the testis with gubernacum and try to pull the testis upto contra lateral DIR.
3. **If it doesn't reach DIR, or evidently the vessels are short, proceed for the 1st stage.**
4. Spermatic vessels are then clipped 2-3 cm above testis and cut.
5. Port removed and come out

Fowlers stephens 2nd stage

Time: at least 6 months after stage I

Position / anaesthesia / RT / Foleys / ports placements

Procedure:

1. After port placement testis is located and observed for viability and texture
2. Peritoneum is incised starting ascend the material ring, rounding around the DIR and moving can lateral from spermatic vessels upto just above the point where spermatic vessels were transacted.
3. Blood supply is thus preserved by lifting the vas and testing on a large peritoneal leaf.
4. Gubernaculum is resected, held and terns pulled upto centre lateral DIR.
5. Fix the testis to sub dartos pouch
6. Check hemostasis, check for any testis in vas / epididymis.
7. Remove ports / come out.

Follow up: under monthly follow up for 6 months

Complaint: general lap. Complaints

Pneumoperitoneum

Injury to

- Gut
- Visceral
- Vessels



Specific Complications:

- Failure to locate testis
- Injury to spermatic vessels
- Injury to vas
- Bleeding
- Failure to reach scrotum
- Testicular orchidopexy / high scrotal orchidopexy
- Testicular retraction

Q. What is **window orchidopexy**?

A. Once this testis is brought down into scrotum, open the tunica vaginalis and stitch the open ends of tunica vaginalis to tunica albuginea. The exposed tunica albuginea will form adhesions to scrotal dartos layers preventing torsion in future.

Q. When does the testis reach DIR in prenatal period?

Ans 23 days

Q. How long to travel through DIR to SIR

Ans 4 weeks

Q. How long it takes to descend from SIR to scrotum

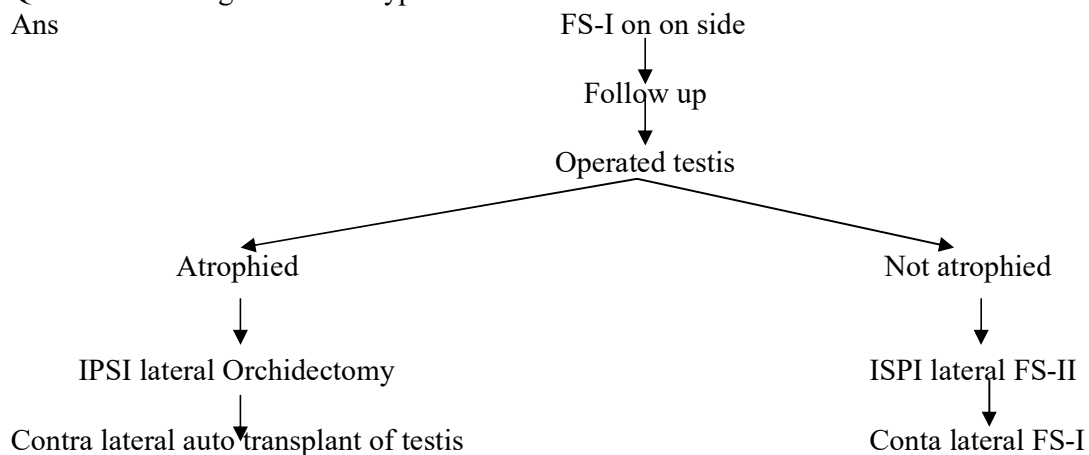
Ans 3 – 4 weeks

Q. At what age gubernaculum develops ?

Ans 7 weeks

Q. How to manage bilateral crypto with short VD?

Ans



Q. What is **FLOWER STEPHENS TEST**?

Ans This test checks whether Fowler Stephen operation can be done or not.

Apply bulldog clamp over the gonadal vessels for 5 minutes

Check for testis cyanosis / no Doppler pulse

Testis albuginea incised 5mm to see for bleeding from albuginea.

Doppler pulse –ve

Testis cyanotic

Then collateral supply is poor and single stage orchidopexy will lead to testicular atrophy.

Q. What is the incidence of testicular atrophy after single stage flower Stephen orchidopexy

Ans 20%



Q. What is the site of collateral circulation in testis?

Ans upper pole

Q. What is contralateral testicular hypertrophy?

Ans C/L testis > 2ml or >2cm then ipsilateral testis.

Q. What are the importance of patent process vaginalis during diagnostic lap. for NPAT?

Ans If process vaginalis is patent, 91% chances that testis is viable.

If process vaginalis is closed, 97% chances that testis is not viable / vanished.

Q. Where will you look for the testis during diagnostic laparoscopy?

Ans Near the internal inguinal ring

Along the spermatic vessels

Along the path of descent

Upto lower pole of kidney

Intra abdominal ectopic locations like peri hepatic, peri splenic, opp. Site

Q. What is the warm ischaemic time for the testis during micro vascular transplantation?

Ans 1 hour

Q. **What is the most important step to preserve the vascularity during lap Orchidopexy?**

Ans **A triangular wedge of peritoneum is preserved b/w the spermatic vessels and vas with the testis at the apex.**

Q. Where will you ligate and cut the spermatic vessels in stage I

Ans Usually it is done 1.5 to 3.0cm from testis (high ligation is preferred)

Recent **KOFF & SETHI** have proposed that spermatic vessels be transected just near to testicular pole.

Q. what is the effect of spermatic vessels transaction on fertility.

Ans Transsection of spermatic vessels lead to decrease in S/T ration and causes more deterioration in semen quality.

Q. **What is the blood supply of the testis?**

Ans Three sources

(1) Internal spermatic artery

b/o abd. Aorta

Main supply to testis

Need to be cut in Fowler stephens stage opn.

(2) Vas Deferential Artery

B/o internal iliac artery

It is the 2nd major supply

In FS-II opn. The viability of testis depends on deferential artery

(3) External spermatic artery

B/o inferior epigastric vessels

Q. What is the size of adult testis?

Ans 5x3x2cm, volume 20ml

Q. What is the rough time table for testicular descent?

Ans Formation of gubernaculum, genitofemoral nerve – 7 week

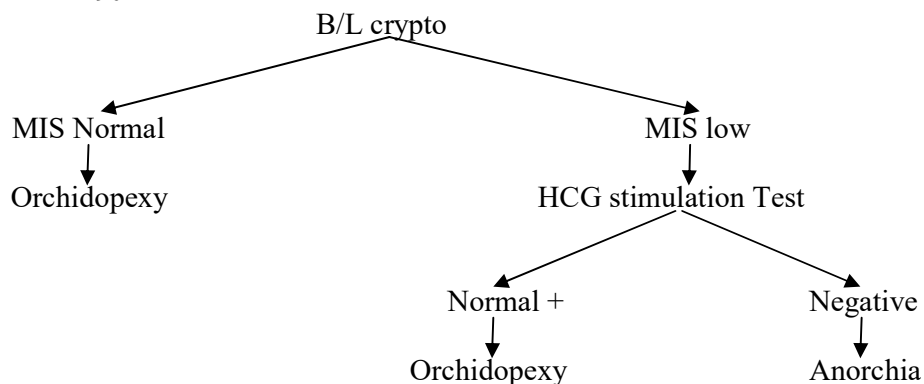
Testis at DIR – 23 weeks (completion of 6th month)

Transverse the inguinal canal – 24-28 weeks (7th month)

Out of SIR – 28 weeks

SIR to scrotum – 28 to 32 weeks (8th month) & 9th month

- Q. Which nerve is important for testicular descent?
 Ans Genitofemoral – N, root value L₁-L₂
 Transaction of GFN causes cryptoorchidism
 Patient with spinal bifida have orchidism
- Q. How does GF nerve help in testicular descent?
 Ans The GFN innervates the gubernaculum from its posterior and caudal surface.
 GFN has calcitonin gene related peptide.
- Q. which hormone is responsible of gubernaculum enlargement?
 Ans InsL₃
- Q. What are the function of different male hormones?
 Ans Androgen → Dissolve / involutes the cranial suspensory ligaments
 MIS → Dissolve / involutes the mullerian duct
 InsL₃ → Enlargement of gubernaculum
 GRGP – calcitonin related gene peptide
 - contraction of gubernaculum
- Q. What are the different theories of UDT?
 Ans Hormonal – Estrogen increase, testosterone decrease, MIS
 Gubernaculum
 GFN & CGRP
 Intra abdominal pressure
 Differential growth
- Q. When will you do hormonal assay (T, FSH, LH)?
 Ans B/L crypto
 Increase FSH/ LH – implies anorchia
 Serum testosterone at 3 months of age
 HCG stimulation test
- Q. How will you do HCG stimulation test ?
 Ans 500 iu HCG on mon, wed and Friday
 Followed by serum testosterone level
 Normally there should be a raise of > 100ng/dl
- Q. What is the importance of MIS as a marker?
 Ans MIS is a glycoprotein synthesized by sertoli cells
 Production continues till puberty and declines after puberty.
 MIS is more definitive marker
 MIS – normal value: 30-40 ng/ml
 MIS < 1ng/ml = Anorchia
 MIS = Normal 98% testicular present
 MIS low means 90% absent



Q. What is testicular auto transplantation?

Ans Transplantation of testis from high abdominal position and transplanting into scrotum.
Requires micro surgical anastomosis or the testicular vessel to inferior epigastric vessels.

Q. What is **HASSEL BACK** triangle?

Ans Triangle formed between:

Suprolaterally : Interior epigastric vessels

Medially : Rectus muscle & sheath

Inferiorly : Inguinal ligament (modified)

: Cooper's ligament (original)

Hassel Bach diagnosis is pierced to bring the mobilized testis to scrotum

Q. What is **TRIANGLE OF DOOM** and its contents?

Ans Sparmatic vessels – Laterally

Vas difference – Medially

Imaging line joining – inferiorly

Contents :

Ext. iliac artery and vein

GFN

Circumflex iliac vein

Q. What is the function of ilio inguinal nerve?

Ans Ilio inguinal nerve travels in front of spermatic cord in the inguinal canal

Gets injured in hernia surgery.

Supplied

- Root of penis
 - Anterior 1/3 of scrotum
 - Labia major
 - Medial aspect of thigh
- } Sensory

Motor: Abdominal musculature

Q. What is the effect of ilio inguinal nerve disruption?

Ans Paraesthesia / burning in lower abdomen

Loss of sensation of medial thigh and scrotum (labia)

Abdominal muscle weakness

Extension of hip joint cause pain

Q. What nerves are at risk of injury during open inguinal dreludopopexy?

Ans Ilio inguinal

Ilio hypogastric

Genital breach of genitor femoral nerve

O. What is Jone's incision?

Ans High inguinal extra peritoneal approach

(extra peritoneal approach that utilizes a higher incision (than std orchidopexy)).

Incision extends from ASIS medially.

Q. What are the keysteps of **JONE’S** operation?

Ans High inguinal extraperitoneal approach

preservation of spermatic vessels

High retroperitoneal mobilization of spermatic vessels

Passage of testis directly through abdominal wall at pubic tubercle

Fix in the scrotum



Q. What are the out dated surgical methods for orchidopexy?

Ans Scrotal Orchidopexy: Bianchi's operation used scrotal incision to explore original canal and for the testis in scrotum
(For palpable UDT)

For NPAT:

1. Midline transperitoneal
2. Midline extraperitoneal
3. Extended inguinal approach (LaRoque Operation)

Q. What is **LA-ROQUE MANOEUVRE**?

Ans In La-Roque measures (original skin incision is inguinal)

The original skin incision is extended superiorly (like gibson's) but original opening of ext. obl. aponeurosis is closed and a fresh incision is made in fascia 3-4cm superior for assess into peritoneum.

Q. What is low ligation orchidopexy?

Ans

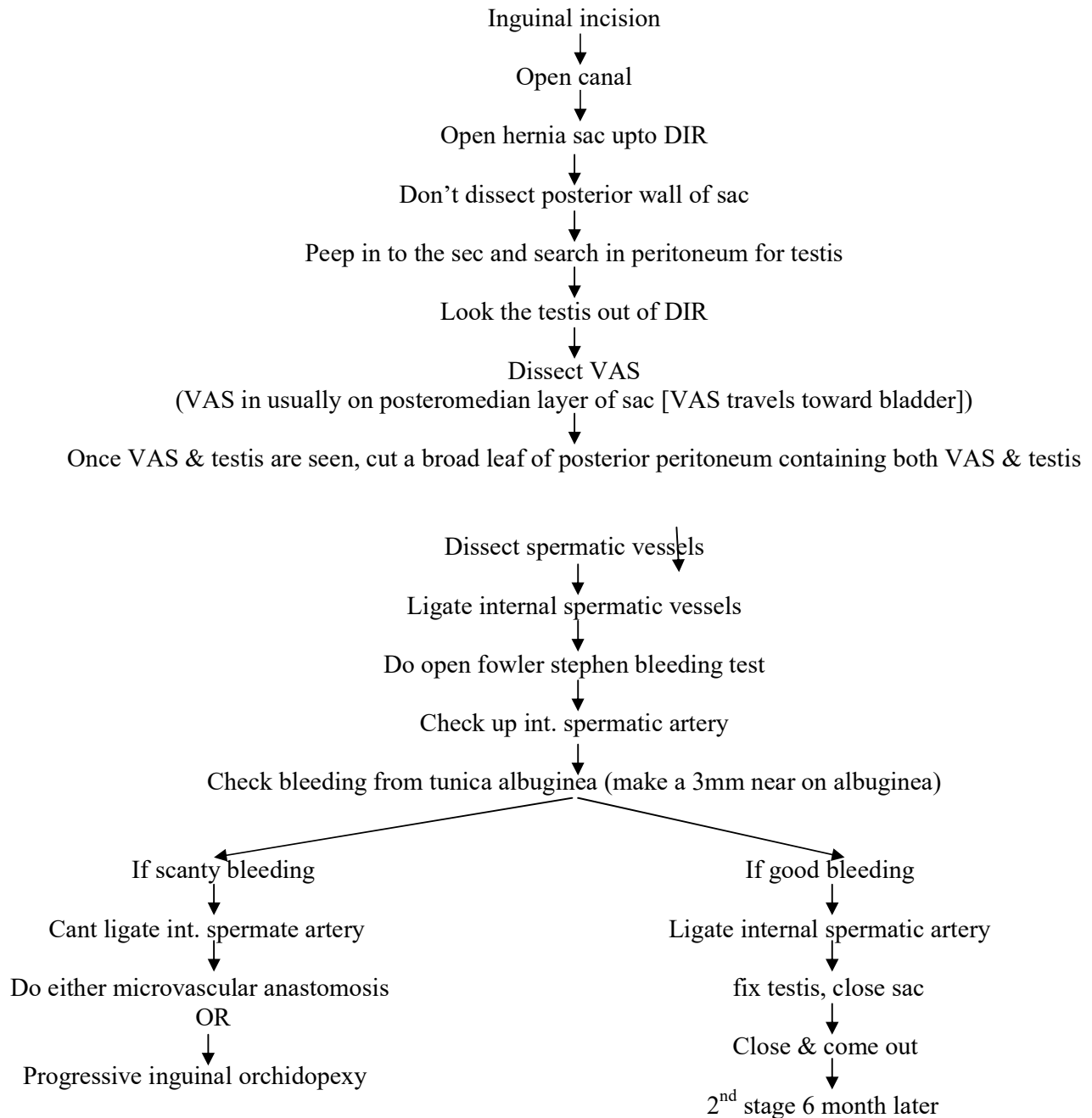
- Ligate and transect the int. spermatic artery as close as to testis.
- Extend this cut incision between the looped limbs of vas so that loop of vas unfolds.
- Maintain 1cm strip of peritoneum around vas.
- Testis now hangs upside down
- Fix to scrotum

Q. What are tails of lock wood?

Ans Tails of lock wood are gubernacular tails.

- Pre pubic
- Pre penile
- Contralateral scrotal
- Femoral
- Perineal

Q. How will you do open folwer stephens



❖ Normal height and weight at birth and then onwards:

- Height: Birth 50cm
 1 year 75cm
 4-5 year 100cm

- Weight: For < 1 year $\frac{Age}{2}$ Kg
 - At birth: 2.5-3 Kg
 - 5 months: Doubles of birth
 - 1 year: Triples
 - 2 year: Four times

❖ Cause of UTI in < 2 years child:

- PUV
- VUR
- Ureterocele
- Duplex System
- Stone
- Megaloureter (POMU)
- Neurogenic Bladder

❖ How to prevent UTI in © with VUR?

- Good bowel habit
- Circumcision
- AMA prophylaxis

❖ Bowel Bladder Dysfunction:

- Acquired abnormality of bladder and bowel function.
- BDD associated with VUR.
- In older child mostly.
- May be due to early attempts to suppress bladder during toilet training period.
- Incomplete emptying leads to high UTI , patient may have high incidence of UTI while on AMA.
- High failure after surgery.
- Less spontaneous resolution of VUR
 - Features:-
 - Recurrent UTI
 - Constipation
 - <3 or > 8 voids /day
 - Poor stream



- Investigation:-
 - **Wall thickening > 2mm**
 - **PVR > 20ml**
 - **MCUG: spinning top deformity**

❖ **In patient with UTI always ask for history of -**

- **Constipation**
- **Nocturnal enuresis**
- **Incontinence**

❖ **Functional anatomy for VUR:**

1. Functional integrity of L/U.
2. Functional dynamics of bladder.
3. Anatomical composition of VUJ.

❖ **HT in VUR:**

- Renin mechanism
- Abnormal Na^+ , K^+ , ATPase activity.
- Dysmorphysm.
- OR both

HT due VUR not corrected with VUR management.

❖ **Implementation of pyelonephritis in VUR:**

1. Producing renal screening
2. Impaired renal growth
3. Leads to HT

When reflux correction improves renal growth, it is likely due to elimination of infection component then relieving reflux itself.

❖ **Best parameters of renal function in © : Somatic growth curve**

❖ **Cause of renal failure and under somatic growth in VUR:**

1. Hyper filtration injury
2. Concentration defect
3. Proteinurea
4. Microalbuminurea
5. RTA

❖ **Investigation approach by Indian Association of Pediatrics (IPA):**

UTI in	<1 year	USG, MCUG, DMSA
	1 – 5 year	USG, DMSA
		MCUG only if, DMSA abnormal
	> 5 year	USG

USG:	Soon after UTI
MCUG:	1-2 week after treatment of UTI
DMSA:	2-3 months after UTI

Presence of asymptomatic bacteriurea in patient of previous treated UTI is not considered as recurrent UTI and not an indication for surgery.

❖ **AAP (American Association of Pediatric):**

- Both urine routine & micro and urine culture & sensitivity to diagnose UTI
- Minimum CFU must be 50,000 not 1,00,000.
- No role of MCUG after first UTI.
- Done after first episode only if:
 - Bilateral HUN
 - Dysmorphism

❖ **Guideline statement for VUR screening in sibling:**

- Combine decision taken by considering © age and USG finding.
- > 5 years with normal USG – nothing to do.
- < 5 years with normal USG – clinical judgment.
- < 5 years abnormal USG – diagnose immediately by MCUG then DMSA.

❖ **What to see in MCUG:**

- Capacity
- Contour of bladder
- Reflux during –
 - active (voiding)
 - Passive (on filling)
- Grade of VUR
- Bladder neck
- Other cause of second VUR
- PVR

Some consultant suggest not to comment on capacity of bladder on MCUG

❖ **D.Adv of reflux grading:**

1. Expected concordance between ureter and calyx doesn't always happens may be due to disproportionate dilation.
2. Associated PUJO & VUR false staging.
3. Subjective.

❖ **Hudson's (Water Hammer Theory) for VUR nephropathy:**

- Sterile reflux can cause renal damage in case of abnormal bladder dynamics.

❖ **Big Bang Theory:**

- The greatest risk of post infection scarring occurs within first years after initial episodes of pyelonephritis. Kidney's prediction for pyelonephritis related to the age of patient.

❖ **When will you do MCUG in patient with UTI?**

- Normally after one week of UTI subsides.
- MCUG in infection: in some borderline causes VUJ antireflux mechanism compromising when infection present.
- Due to infection and oedema.

So when patient with negative MCUG but having high suspicion of VUR – do MCUG during active UTI but under antibiotic coverage.

❖ **Advantages and D.Adv of radio nucleotide cystography:**

Advantage:

1. Decrease radiation C/C to MCUG.
1% radiation that of MCUG.
2. Used for screening and monitoring.

D. Advantage:

1. Poor anatomical delineation.
2. Poor sensitivity of grading.
3. Grade II reflux into distal ureter poorly delineated.

❖ **Top down approach rationale: Hudson et al.**

- Significant reflux that have potential to cause renal damage should uncovered and in absent of DMSA findings not likely to have significant VUR.
- Based on Hudson study.
- But it can not detect **33%** of reflux.
- Significant in old child or for sibling screening of VUR.

❖ D. Advantage of PIC technique:

1. Not physiological.
2. Age adjusted pressure not allowed
3. Some pressure can be very high for newborn.

❖ **Normal size of kidney on USG:**

0-6 months: 5cm

6-12 months: 6cm

1-5 year: 7-7.5cm

❖ **VUR and Pregnancy:**

- History of VUR in childhood leads to increase to pyelonephritis / UTI in pregnancy
- Women with scan in kidney have
 - **3.5 times** risk for HT during pregnancy
 - **7 fold** high risk for eclampsia
- Bilateral scarring has more risk
- Presence of scarring not VUR is primary importance for morbidity

Reflux in female child in puberty:

Then there are two schools of thought for management of it

- Go for VUR correction surgery
- Wait for pregnancy – if pyelonephritis occurs, treatment with antibiotics for pyelonephritis.
- Not to go for surgery

This is always debatable

(I have asked many consultant but all have different opinion. So, best to ask your teaching consultant and answer as per institutional protocol.)

❖ **IF VUR and PUJO associated why PUJO should be treated first?**

- Obstruction is more damaging than VUR
- VUR correction can introduce infection to obstructed pelvis
- Some oedema following VUR surgery can increase obstruction level.
- PUJO likely to resolve post VUR correction

So do first pyeloplasty & then VUR correction if needed OR

Pyeloplasty with STRING

But, never do pyeloplasty & re-implantation simultaneously.

❖ **VUR Spontaneous Resolution:**

- At birth probability of spontaneous resolution related to VUR grade. If encounter at later date then related to grade and age of presentation.

Grade I	90-100%	} Spontaneous Resolution
Grade II	80-90%	
Grade III	60-70%	
Grade IV	30-40%	
Grade V	15-20%	

- Reflux likely to resolve spontaneous by 5 years of age
- As by 5 year remodeling of VUJ occurs maximum by:
 1. **Progressive elongation**
 2. **Condensation of intramural ureter**
 3. **Stability of bladder dynamics**
- So, 5 years is considered as cut-off for waiting period for spontaneous resolution

❖ **Aim of medical management in VUR:**

1. **To keep urine sterile.**
2. **Optimize condition for spontaneous resolution of VUR.**

❖ **Indication for medical management in VUR:**

1. **0-10 years unilateral or bilateral I/II grade with/without scarring**
2. **0-5 years unilateral or bilateral III/IV grade with/without scarring**
3. **0-5 years unilateral or bilateral V grade without scarring**
4. **6-10 years unilateral III/IV grade with/without scarring**
5. **1-10 years unilateral or bilateral V grade with/without scarring**

But patient have >1 previous pyelonephritis }
Global reduced function } Don't wait for medical management
Scarring with bilateral grade V VUR }

❖ **Medical management is known as watchfull waiting.**

- **As it doesn't correct VUR.**
- **But the consequences of reflux is prevented by it.**
- **So better to know as waterfull waiting.**

❖ **How long monitor patient with watchfull waiting?**

- Urine routine and micro & urine culture and sensitivity – 3 monthly to rule out break thorough infection
- USG – 6-12 monthly to rule out growth of kidney scarring
- MCUG – 1½ yearly

Look for weight gain, blood pressure monitoring on every visit follow-up.

❖ **When to stop W/W:**

1. **1 week after MCUG if VUR resolved**
2. **If VUR not resolved but age 5 years and if –**
 - **Child toilet training**
 - **Compliant**
 - **Normal bowel habits**
 - **Verbally communicable**
 - **Ready to take treatment if UTI**



❖ **Indication of surgery in patient with w/w:**

1. Break through UTI

Rule out

- Under dosing
- Compliance of patient
- High PVR
- Resistance

2. Non compliant patient

3. Development of new scar

4. Failure to interval growth of kidney

5. Failure of somatic interval growth

❖ **Famous studies for AMA in w/w for VUR:**

1. RIVUR Study:

Randomized intervention study for VUR

In without AMA decrease 50% UTI in VUR

Decrease 60% febrile UTI

Decrease 80% UTI in B.B.D. patient

Compliance of patient 75%

2. Interventional reflux study

3. Birthmingham reflux study

❖ **Options for Re-do VUR surgery:**

- Difficult.
- Mobilized ureter intra vesically / extra vesically.
- If ureter is shorten: Psoas hitch can be helpful.
- But psoas hitch can't be taken bilateral
can do psoas hitch to one side and re-implant another side or transureteroureteric anastomosis
- Boari flap
- Ileal ureter can used

❖ **Factors predicting success of endoscopic VUR management:**

- 1. Age, sex**
- 2. Grade of VUR**
- 3. Unilateral or bilateral**
- 4. Voiding dysfunction**
- 5. Duplication**

D.Adv. of endoscopic management:

1. Costly
2. Durability is issue
3. Requires special instruments
4. Poor result for high grade VUR

❖ **Principles of VUR operation:**

- 1. Exclusion of secondary VUR cause**
- 2. Adequate mobilization of ureter**
Ureter should reach upto C/L ureter
- 3. Submucosal tunnel paquine ratio: 5:1 Ratio**
- 4. Detrussor muscle backing of L/U**
- 5. Gentle handling of bladder to prevent spasm and overactivity**

❖ **Various operative techniques for VUR correction:**

- **Intravesical: Cohen's cross triangular**

Advantage:

- Simplicity
- Reliability
- Long tunnel length without kinking
- Along with neck reconstruction can be done

D. advantage:

- Further cannulation of u/o will be difficult can be Overcome by
→ **Curved tip RGC**
→ **Flexy cystoscope**

If bilateral correction to be done then more laterally placed U.O. reimplanted superiority on C/L side and other side inferiorly on more affected side.

- **Glen Anderson:**

Advantage:

- Easy
- Less kinking & obstruction

D. Advantage:

- Not much longer tunnel.
- Distal ureteric anastomosis difficult due to proximity with B.N.

- **Lead Batter Politano:**

Modified LP:

After opening bladder lateral wall retracted and re-implant done on posterior lateral wall.

While in modified surgery:

Retracting superior lip of bladder to prevent injury and made orifice medial to original orifice.

❖ **Combined: Paquin Surgery:**

❖ **Extravesical:**

Lich Graiger:

M.C. post operative complication: Transient voiding dysfunction due to pelvic nerve damage 20%

(Pelvic plexus lies 1.5-2cm dosomedial to VUJ small ureter branches travelled to medial side of ureter)

Patient fails to voids – put PUC for 1-2 weeks, mostly recover within 1-2 weeks.

❖ **Causing of worsening of © UTI who is initially doing well with w/w & AMA:**

- **BBD**
- **Poor compliance**
- **Inappropriate dose**
- **Inappropriate hygiene after defecation**
- **Resistance organism**

❖ **Cause of failure of surgical correction:**

1. **Failed to identify secondary VUR cause**
2. **Inadequate tunnel length**
3. **High grade reflux**
4. **Failed to taper ureter**
5. **Poor bladder dynamics**

❖ **Laparoscopic approaches for VUR correction:**

1. Gilverate surgery
2. Laparoscopic extravesical approach
3. Endoscopic cross trigonal cohen's

❖ **P.E.T. Percutaneous endoscopic trigonoplasty**

❖ **Complication of VUR surgery:**

1. **Early:**

- Persistent reflux
- Presence of C/L reflux
- Obstruction – mostly due to
 - Clots
 - Oedema
 - Submucosal hematoma

Resolve within 1-2 weeks

Put DJ stent

2. **Late:**

Obstruction:

- Suprahiatal:
 - Twisting
 - Ischemia of ureter
- Hiatus
- Point of entry – angulation
 - High reimplant: point of entry is anterior and lateral
- Tunnel: compression of ureter
- Orifice: stenosis

❖ **Follow up of patient with anti reflux surgery:**

- Many patient have persistent HUN upto 3 months post surgery
- Not persist after 3 months
- If HUN persist for >3 months → Do MCUG
- Patient with renal scar -
 - Always monitor with blood pressure
 - Urine routine & micro to look for UTI

❖ In anti reflux surgery ureter should dissected from **Waldeyer's sheath** and look shiny if dissected properly

Glans & Da Vinchi: 1st describe VUR

Q: who described pathophysiology of reflux?

A: Ransley & Risdon

Q: what is VUR?

A: VUR is the reflux of urine from bladder back into ureter

Q: what is the incidence of VUR?

A:

- 1st year – 70% of UTI pts, in © 30% with reflux UTI
- upto 1 yr incidence is more in males after 1 yr of age incidence is more in females
- By 5 yr incidence reduces to 20% of UTI patients
- 1-2 % of asymptomatic children have reflux

Q: what are the chances of hereditary involvement in reflux patients?

A: In sibling: 32%

Twins	100%
Older sibling	11%
Younger sibling	33-44%
Father → son	66% chances

Q: what can be the genes involved in pathophysiology of VUR?

A: mutations of following genes are hypothesized in pathophysiology of VUR

- pax-2 (chr-10),
- Gdnf (glial derivative neurotrophic factor) –
- RET (RET is the receptor for GDNF)

Q: What is CAKUT?

A: congenital abnormalities of kidney & urinary Tract:

VUR is a part of CAKUT

Genetic abnormality of ureteric bud developing

Q: what is Paquin's ratio?

A: 5:1,

Tunnel/ureteric diameter = 5/1

Q: what is the intravesical ureteric length?

A:

1-6 yr = 6mm

6-9 yr = 9mm

9-12yr = 12mm

12 year and above = 15 mm

Q: what are the types of reflux?

A: Primary reflux: when VUJn is primary at fault – inadequate tunnel length is issue

Secondary reflux; when VUJn is normal but reflux is due to high pressure in bladder

Overwhelming VUJ

Bladder hostile

Excessive storage / emptying pressure

Q: what happens in primary reflux?

A: Paquin's ratio is altered

Usually intramural length is less

Q: what are the causes of secondary reflux?

A: BOO →

1. PUV -50-70 % of PUV have reflux
2. Ureterocele → due to ureteroceles which block bladder neck
3. spina bifida /sacral dysmorphism
4. Dysfn Bladder
5. Bowel –Bladder dysfn (BBD)
6. Constipation

Q: what is the cut off bladder pressure for VUR?

A: 40 cm H₂O @ full Bladder

Q: how is reflux associated with UTI?

A: reflux mechanically delivers the infected urine to renal pelvis

Significant HN and HUN acts as reservoir of infected urine

Bacterial endotoxins paralyse the ureteric peristalsis

Q: Who described the grading of reflux?

A: Labowitz grading of reflux

Q: what are the grades of Reflux?

A: International reflux study committee classification (Labowitz) grading of reflux as on VCUG

Grade	Urine reflow upto	Dilation/distortion
1	Ureter	Non dilated
2	Renal pelvis	non dilated
3	Renal pelvis	mild dilation +
4	Renal pelvis	moderate dilation + Blunt fornices
5	Renal pelvis	grossly dilated with loss of papillary impression + Tortuous ureter

Q: what is mackie-stephen's theory associating VUR and renal dysplasia?

A: abnormally originated ureteric bud will interact abnormally with metanephric blastema thus leading to more renal dysmorphism, in short more severe reflux more severe are renal dysplastic changes.

Q: what is the weigert Meyer rule?

A: In cases of complete ureteric duplication,

- The upper moiety draining ureter ends in lower/medial ureteric orifice which is obstructive
- The lower moiety draining ureter ends in upper / lateral ureteric orifice which is refluxive, due to shorter intramural length

Q: what is water hammer renal damage?

A: this depicts the renal damage from the reflux of "sterile" urine

Q: which part of kidney is most affected by VUR scarring?

A: renal poles, that too upper pole more affected than lower pole

Because of the straight in-line alignment of collecting ducts in papilla openings, so that refluxed urine enters in the collecting ducts at its maximum force and alignment.

Q: what is the RNC grading?

A: Radio nucleotide cystography (RNC) grading

Grade 1 = Grade 1 (of VCUG) = reflux upto ureter

Low grade = 2 = Grade ii & iii (of VCUG) = reflux upto pelvis with minimal dilation

High grade reflux = 3 = grade iv & v (of VCUG) = reflux in pelvis + dilation

Q: how will you evaluate the pt of suspected reflux?

A: urine routine, urine culture, RFT, CBC

Q: How will you collect the urine samples in a child?

A: if a child can void on command (toilet trained) → mid stream sample

Otherwise: catheterized samples

Suprapubic aspiration (Best)

Bagged specimen (works)

Q: what is direct & indirect cystogram?

A: direct: Bladder is filled directly by catheter

Indirect: Bladder is filled indirectly by IVP

Q: what are the other non invasive ways to evaluate VUR?

A: Radio nucleotide cystogram RNC

VCUG with colour Doppler

Q: what is specifically seen in physical examination?

A: spinal examination / hairy tuft at back / sacral dimple / gluteal folds/ phimosis/palpable bladder/palpable abdominal lump/general growth of child/

Q: what is passive / active reflux?

A: Passive reflux: occurs even during Bladder filling /resting

Active reflux: occurs during voiding

Q: in a pt with active UTI; when will you do VCUG?

A: after UTI subsides /atleast one week after or longer

Q: why do you want a Uroflowmetry in VUR cases?

A: to see the flow pattern

To D/D primary v/s secondary VUR

Q: when will you do cystoscopy?

A: at the time of operation

- To see for ureteric orifice, duplication , diverticulum etc
- To do STING operation

Q: what is PIC technique?

A: positioning instillation of contrast

- Contrast is instilled directly near/ at the U.O. under Cystoscopy & IITV guidance ↓ G/A
 - If contrast enters ureter, then reflux is present
- additional 20% cases can be diagnosed

Q: How will you evaluate upper Tracts?

A: USG

DMSA → sensitivity 98%, specificity- 92%

Q: what will you see in USG?

A:

- HN, HUN
- Renal dimension – small kidneys, - irregular outline
- CMD differentiation
- USG with colour doppler for renal vasculature
- Resistive indices on doppler
- Bladder wall thickness (> 4mm = abnormal thickening)

Q; what are USG features of renal dysplasia?

A: small kidney + loss of CMD + increased echogenicity

Q: At what interval will you do serial USG kidney in watchful waiting?

A: @ 6 month interval

Q: what is the basis of doing DMSA?

A: ⁹⁹Tc labeled DMSA is taken up only by functioning tubular tissue, where it binds for several hours

- The uptake of DMSA is proportional to GFR
- Because pyelonephritis impairs tubular uptake of radiotracer, these areas will fail to emit photons and appear as under exposed (cold spots)
- Sensitivity 90%, specificity 92%

Q: when will you do DMSA scar in a UTI pt?

A: after 6 months of UTI attack

- Scar formation by 6 months
- All DMSA defects are not scars

Q: what are Ransley Risdon theories in VUR?

A:

1. Reflux nephropathy can occur only in infected reflux
2. Ransley Risdon big bang theory ; most of the pyelonephritic scarring occurs in the 1st attack

Q: can primary & secondary reflux co-exist?

A: yes

Q: what are the associated conditions with VUR?

A: from above downwards anatomically

1. Renal anomalies-multicystic dysplastic kidney, - renal agenesis
2. PUJn obstn (1-2%)
3. Ureteric duplication
4. Mega cystic mega ureter
5. Bladder diverticulum
6. Epispadias
7. PUV

Q: how are PUJn & VUR related?

A:

- both are due to ureteric bud abnormality
- 9-18 % of PUJn obstruction have VUR
- 1-3% of VUR pts have PUJn obstn
- Pyeloplasty should be performed first ,
- if pt is suffering primarily with higher abnormality (PUJ) chances of lower abnormal are high (10-20%)
- If pt is suffering primarily with lower abnormality (VUR) chances of upper abnormal are low (1-2%)

Q: what are the radiological signs on VCUG to suspect concomitant PUJn obstruction in pts of VUR?

A:

1. Discrepancy in dilation of ureter & pelvis
2. Pelvis will not fill with contrast but very dilated ureter
3. Contrast that enters pelvis dilutes away
4. Contrast that enters pelvis stays there in pelvis for exceptionally long time.

Q: what is secondary PUJn obstn?

A: PUJn obstn caused due to VUR

VUR causes kinking of ureter at PUJn

- Chronic stretching of renal pelvis leading to atonicity of PUJn
- Chronic inflammation & fibrosis due to recurrent UTI

Q: How will you confirm PUJn obstruction with VUR?

A: nullify reflux by deploying foleys catheter → do MAG3 / EC nuclear scan → $T_{1/2} > 20$ min ⇒ obstruction
→ do pyeloplasty

Q: If both PUJn obstruction & VUR is there, what will you operate first?

A: PUJn pyeloplasty fl/by VUR repair

Q: what is the relation b/w VUR & paraureteric diverticulum?

A:

- VUR is considered as independent variety in cases of Para ureteric orifice diverticulum
- Treatment of VUR & paraureteric diverticulum should be done independent of each other
- VUR should be operated if U.O opens into diverticulum

Q: what is the relation b/w VUR & renal abnormalities?

A:

- MCDK & renal agenesis are two most common condition associated with VUR
- Contralateral system has 25% chances of reflux (ipsilateral system is not working in MCDK or agenesis)
- MCDK-reflux corrects with time
- High grade – reflux needs surgical correction

Q: what is megacystis-mega ureter syndrome?

A: In pts of VUR, bladder expels urine to exterior as well as up into the ureter. The refluxed urine comes back and fills bladder again. This chronic process leads to gradual but gross dilation of bladder & upper tracts → megacystitis megaureter syndrome

D/D

- Prone belly syndrome
- PUV

Q: what are the syndromes associated with VUR?

A:

1. VACTERL
 2. CHARGE
 3. Imperforate anus
 4. Exstrophy
-
1. Vertebral ,anal, cardiac, Tracheo esophageal renal limb anomalies
 2. Coloboma, heart diseases, atresia choanae, retarded mental, genital hypoplasia, ear abnormal
 3. Imperforate anus

Q: Is routine cystoscopy done in VUR pts?

A: no

Q: what are the indications for cystoscopy?

A: suspected ureteric duplication

- Bladder diverticulum
- Suspected ectopic ureter
- During endoscopic Sx

Q: what are the indⁿ for MCUG in cases of VUR?

A:

- all children younger than 5 yr with documented UTI
- All children with febrile UTI
- Any male regardless of age / fever/ unless sexually active

Q: what are the consequences of VUR?

A:

- `pyelonephritis → pyelonephritis causes scar – small kidney, HTN
- Recurrent UTI
- Renal scarring
- HTN
- Renal failure

Q: what is the most common presentation with VUR?

A: LUTS / recurrent UTI

Pain is not a cardinal presenting feature in VUR

Q: how will you stepwise investigate the patient radiologically?

A; USG → VCUG → DMSA (nuclear scar)

USG → nuclear scar DMSA → VCUG (Hanson's study)

Q; when can you do video urodynamics in cases of VUR?

A: In cases of neurogenic bladder associated with VUR

Q: How will you screen for VUR in just new born?

A: USG @ 1 wk } if both are normal → then VUR is highly unlikely
USG @ 1 month }

Q: what are the indn for VCUG in newborn?

A:
B/L high grade HN
Ureteric dilation
Ureterocele
Duplex system

Q: What is the recurrence rate after endoscopic management?

A: 20% @ 2 yrs
Depends upon initial grade of reflux

Q: what is the most common performed & most reliable operation for VUR?

A: Cohen's cross trigonal (check this answer, some examiners will like – lead better polatino operation)

Q: If bilateral VUR is there which open surgery approach is better?

A: Intravesical approach Cohen's
(Extravesical B/L leads to post operative retention of urine)

Q: what is the indn of cystoscopy before operation?

A: Before extravesical lich gregoir operation

Q: what is the bottom line for management of VUR?

A:
Age 0-1 yr: antibiotic prophylaxis
Age 1-5 yrs – high grade → sx is an option if bilateral VUR, medical management for unilateral VUR
- low grade → endoscopic management
If with LUTS → treat LUTS first

Q: when can you offer endoscopic management in VUR?

A: low grade VUR

Q: in a patient of acute UTI, when will you do VCUG?

A:
- UTI leads to ureteric orifice odema and may show false positive or negative VCUG
- VCUG is an invasive procedure
- Start antibiotics
- Do VCUG atleast after 1 wk (preferably 2 wks) allowing infection, inflammation, odema to settle

Q: what is the present status of RNC?

A: for screening
For surgical fl/up

Q: what are the types of PUJ obstruction in pts with VUR?

A: Holowell grouping
Group 1: primary PUJn obstruction + incidental low grade reflux
Group 2: secondary PUJn obstruction due to primary high grade reflux
Group 3: only dilation of renal pelvis + good drainage of upper tracts

Q: what are the general principles of VUR management?

A: Walker summarized the following general principles of management in children with known vesicoureteral reflux (VUR)

- Spontaneous resolution of VUR is common in young children but is less common as puberty approaches
- Severe reflux is unlikely to spontaneously resolve
- Sterile reflux, in general, does not result in reflux nephropathy
- Long-term antibiotic prophylaxis in children is safe
- Surgery to correct VUR is highly successful in experienced hands

Q: what are the management options for VUR?

A:

- observation / wait & watch
- Medical management/ antibiotic prophylaxis
- Surgical management (>95% success rates)
- Endoscopic management

Q: which VUR cases get spontaneously resolved?

A:

- grade 1 and grade 2 will resolve spontaneously by 5 yrs of age- 80% chances
- Grade 3 : 50% cases will get resolved
- Higher the grade ; less are the chances of resolving spontaneously

Q: what is the rationale of medical management?

A:

- Low dose- prophylactic – antibiotic therapy upto 5 yr of age
- 5 yr is an ample time for low grade VUR to resolve
- After 5 yr of age kidneys become less susceptible to pyelonephritic scarring
- Low dose, single daily, night time dosage. long term antibiotics produce minimal side effects.

Q: what antibiotics can you use during watchful waiting period?

A:

- 0-2 months of age: Trimethoprim/ amoxicillin 5mg/kg/day can be given
- Sulfamethoxazole is not given because of hepatic immaturity and inability to clear sulfamethoxazole.
- 2 months & above = trimethoprim-sulfamethoxazole (TST) (Septran) (1-2 mg/kg/day)
Nitrofurantion (1-2 mg/kg/day)
Cephalexin (1-2mg/kg/day) - Ototoxic, -nephrotoxic

Q: what are the side effects of these medicines?

A:

- sulfamethoxazole: displaces fetal Bilirubin → leads to jaundice
- Trimethoprim – sulphamethoxazole → jaundice/ kernicterus, GIT disturbances, allergy
- Septran- drug allergy, leucopenia.
- Nitrofurantion: pulmonary fibrosis,
- Niftran syrup - intestinal pneumonia, gi disturbances, peripheral neuropathy
Bleeding in GCPD deficiency
- Cephalexin - Ototoxic, nephrotoxic

Q: how will you treat a child of reflux age < 1 yr?

A: For age < 1 yr

- Any grade reflux/ unilateral / bilateral/ scarred/ unscarred
- Just give antibiotics & wait & watch

Q: how will you Rx pt of age 1-5 yr VUR?

A:

- for grade 1,2,3,4- antibiotic prophylaxis-Irrespective of grade/scar/laterality
- For grade -5 : surgery if scarring is present (U/L or B/L)
 - Antibiotic prophylaxis if scarring is absent
- **In nut shell: for age 1-5 , surgery is offered only when scarring is present with grade 5**
- The classic approach is to offer daily low-dose prophylactic antibiotic suppression of infections as the first line of treatment under the principle that every case of reflux should be offered time to resolve spontaneously, despite grade.

Q: How will you treat a patient of age 6 -10 yr with VUR?

A:

Grade 1, 2: medical prophylaxis

Grade 3-4 – unilateral/bilateral - antibiotic prophylaxis if asymptomatic

-Bilateral VUR - Surgery if symptomatic /scarring

Grade 5 – Surgery even if unilateral, irrespective of scarring

Q: what is the dis adv of antibiotic prophylaxis?

A:

- Long term
- Non economical
- Patient /child poor compliance
- Chance of repeated / break through infection
- Added childhood infection / viral fever / URTI
- Side effects of medicines

Q: what is drug holiday?

A: when all medicines (prophylactic antibiotics) are stopped. And the pts is actively watched & fl/up

Q: what are the indications for surgery as primary treatment modality in VUR patients?

A:

- age < 1 yr :-- no indn
- age 1-5 yr : proven renal damage (scarring) with grade 5 reflux
- age 6-10 yr : Bilateral grade 4 reflux or unilateral grade 5 reflux

Q: who described the STING procedure?

A: It was **O'Donnell and Puri (1986)** who popularized the technique

- They coined the term STING (Subureteric Teflon Injection)
- The ability to correct reflux in a large proportion of patients (the more recent studies report success
- rates approaching 90% after one injection of Deflux in low grade primary reflux on an outpatient basis
- using a simple procedure with minimal morbidity

- The classic STING technique was described by O'Donnell and Puri (1984).

Q: describe the procedure of STING?

A:

- Prophylactic antibiotic is usually administered with induction of anesthesia.
- A cystoscopy should be carried out before opening the materials in case the procedure is cancelled due to inflammatory changes in the bladder.
- If a rigid needle is used, an offset lens injection scope should be used. If a flexible needle is used, a standard 0- or 30-degree lens cystoscope can be used.
- The size of the needle varies depending of the viscosity of the material and ranges from 3.7 Fr to 5 Fr.
- The viscosity of the material also determines whether injecting the material can be carried out using a regular syringe or requires a ratcheted metal syringe holder.
- A 3-Fr ureteric catheter may be introduced to lift up the anterior wall of the ureter and identify the axis of the tunnel. The needle is inserted with the bevel facing up at the 6 o'clock position.
- The original description by O'Donnell and Puri suggested entering the mucosa 2 to 3 mm distal to the uretero vesical junction and advancing the needle in the submucosal plane for a distance of 4 to 5 mm.
- Injection should be carried out slowly. If the needle is positioned in the submucosal plane, the mound becomes apparent with the initial injection of 0.1 to 0.2 mL
- Once a volcano appearance with the ureteral meatus on top of the mound is achieved, additional volume is injected until the ureteral orifice becomes crescent or slit shaped.
- For most materials, the needle should be kept in place for 1 minute at the end of the injection to reduce extrusion of the material at the injection site. With Deflux this step is not essential.
- The bladder is emptied, and the mound is inspected with an empty and a full bladder to ensure that adequate support of the ureter is persistent.
- At the end of the procedure lidocaine gel may be instilled in the urethra; catheter drainage is not necessary. In general the child spends a brief amount of time in the recovery room followed by discharge. All activities can be resumed immediately.

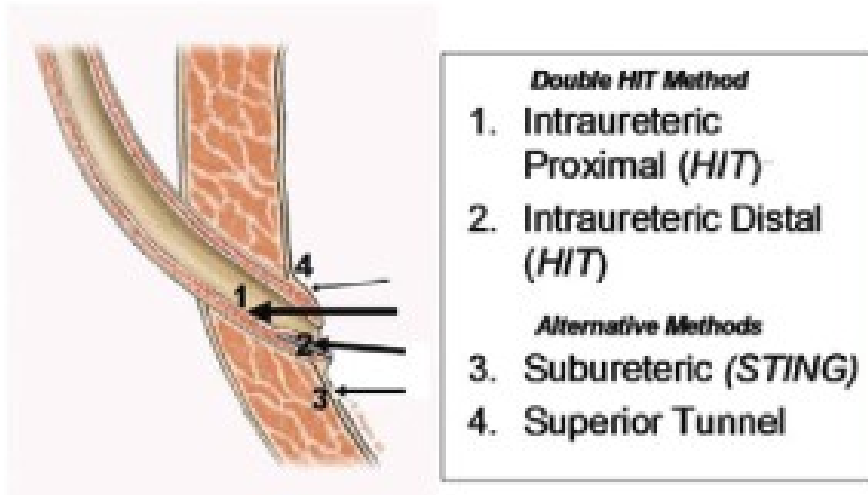
Q: what is HIT and what is double HIT? How do they differ from STING?

A: Hydro-distention implantation technique (HIT)

- When single injection is made just into the bed of ureteric tunnel (proximal to VUJn) it is called single HIT .usually done for low grade reflux.
- When one injection is additionally injected into the bed of the ureteric tunnel in more proximal position, it is called double HIT. double HIT is used for high grade reflux
- In STING the injection is made just below the lower lip of VUJn in sub ureteric position
- In 2004, Kirsch described a modification called the hydrodistention implantation technique (HIT) . The needle is advanced into the ureteral tunnel and Dx/Ha is injected along the entire length of the detrusor tunnel for maximal coaptation.
- A total of 89% of patients undergoing HIT had resolution of reflux versus 79% undergoing standard STING .

- HIT was further modified to include two intraureteral injections (proximal and distal), for total ureteral tunnel coaptation. The goals of "double HIT" are to create a "mountain range appearance" of the ureteral tunnel and eliminate hydrodistention.
- Success rates ranged from 70 to 95%.









Needle Placement Algorithm



Q: how will you decide that where to inject and how many injections are needed?

A: according to hydro distention grading of VUJn on cystoscopy

Dynamic Hydrodistention Classification

H0	UO does not open		
H1	UO opens slightly, cannot see into tunnel		
H2	Can see into tunnel, not extravascular ureter		
H3	Can see up extravascular ureter, ureteroscopy		

Q: what are the complications of STING?

A: Bleeding, LUTS and transient urinary retention

Rarely, bleeding occurs at the puncture site. This is best dealt with by emptying the bladder and applying gentle pressure with the tip of the scope until the bleeding stops.

Cauterizing the area is not advisable because it results in sloughing of the mucosa and extrusion of the injected material.

Q: how will you follow-up a child of STING?

A: The child is maintained on antibiotics for 3 months when a follow-up ultrasound and VCUG are obtained.

- If reflux resolves ,continue antibiotics for another 3 months and then stop, followed by 6 monthly USG and one VCUG after 12 months
- If reflux is persistent, a repeat injection can be considered 6 months after the initial injection.
- If there is still no resolution, then open surgery is recommended.

Q: what are the agents used for Endoscopic Correction of Vesicoureteral Reflux?

A:

Nonautologous Materials

- Poly tetra fluoro ethylene (PTFE)
- Cross-linked bovine collagen
- Poly dimethyl siloxane
- Dextranomer hyaluronic copolymer (Deflux)
- Coaptite

Autologous Materials

- Chondrocytes
- Fat
- Collagen
- Muscle

Q: what are the major disadvantage /concern with STING?

A: The concern with the particulate agents is **migration** and with degradable agents is **durability**.

Q: what are the advantages of injection therapy?

A: one-day OPD base treatment

Either complete resolution of reflux or at least partial resolution of reflux.

Prevents water hammer damage

Q: how does distant migration occurs?

A: distant migration can occur by two mechanisms.

- The first is expansion of the injected bolus, which may lead to disruption of the small vessels in the area of the distal ureter and trigone, resulting in the material gaining intravascular access. Particles smaller than 50 μm may bypass the pulmonary vascular bed and thus access the systemic circulation and reach other organs in the body.

- The second migration mechanism is by phagocytosis of the injected particles by tissue macrophages or blood-borne monocytes. The particle size determines whether phagocytosis can occur, as it is generally agreed that phagocytosis requires a particle less than 80 μm in diameter.

Q: what is Deflux?

A: Dextranomer/Hyaluronic Copolymer (Deflux)

Dextranomer/Hyaluronic Copolymer (DX/HA) is formed of cross linked dextranomer microspheres (80 to 250 μm in diameter) suspended in a carrier gel of stabilized sodium hyaluronate. DX/HA is biodegradable, the carrier gel is reabsorbed, and the dextranomer microspheres capsulated by fibroblast migration and collagen ingrowth. DX/HA loses about 23% of its volume beyond 3 months of follow-up .

Q: what are the various operations for VUR correction?

A:

Extravesical

Lich-Gregoir : The juxtavesical ureter is dissected and a submucosal groove is created extending laterally from the ureteral hiatus along the course of the ureter. The ureter is placed in the groove and the detrusor is closed over the ureter.

Advantages: This technique does not require bladder opening or ureteral stent placement.

Disadvantages: There is an increased risk for pelvic nerve damage and urinary retention, especially for bilateral procedures, and is not performed within the first year of life.

INTRAVESICAL

Politano-Leadbetter: The ureter is mobilized intravesically and then brought through a new muscular hiatus located superior and lateral to the original mucosal orifice .

Advantages: This technique enables creation of a longer tunnel, which is useful in higher grades of reflux.

Disadvantages: In addition to postoperative hematuria, patients are at risk for ureteral kinking/obstruction and bowel injury.

Glenn-Anderson: The ureter is advanced distally through a submucosal tunnel extending inferomedially towards the bladder neck. A later modification with proximal incision of the detrusor at the original hiatus enabled creation of a longer tunnel.

Advantages: There is a reduced risk for ureteral kinking/obstruction with this technique.

Disadvantages: The distal ureteral anastomosis may be challenging due to proximity to the bladder neck.

Cohen : The ureter is advanced through a submucosal tunnel across the trigone to the contralateral bladder wall with the new mucosal orifice located superior to the contralateral orifice .

Advantages: This technique enables creation of a longer tunnel length and avoids ureteral kinking.

Disadvantages: Retrograde catheterization is difficult following repair.

❖ **Health benefit of neonatal circumcision:**

- Decrease risk of UTI
- Decrease the risk of STD
- Decrease the risk of HIV
- Decrease the risk of Ca Penis
- But it doesn't protect against CIS. Carcinoma in situ

❖ **Smegma:**

Produced by chronic irritative effect of bacterial action on desquamated cells, which leads to chronic irritation → Ca Penis

Health benefits of neonatal circumcision outweigh risk of anesthesia and recommended to allow if parents are willing to do.

❖ **Anemia in Ca Penis:**

1. Significant bleeding from lesion
2. Malignancy associated cachexia
3. Vessel blow out

❖ **Why there is no skip lesion in Ca Penis?**

Ca penis spread to LN by lymphatic embolisation so no chances of skip lesions.
While C/C to melanomas spread by lymphatic permeation → Skip lesion

❖ **What consist of FICARA'S normogram?**

- Grade
- Depth of lesion
- LVI
- Pattern of growth
- LN status
- Corpora invasion
- Urethra involvement

❖ **Histopathology grading systems of Ca Penis:**

- **Who grading:**
 - I Similar to normal squamous cells, except basal cells and minimal axypia
 - II Not fit into grade-I or III
 - III Predominant anaplastic cells
- **Maiche Grading:** Basis of –
 - Degree of keratinization
 - Axypia
 - Mitosis
 - Leukocytes present or not



❖ Lymphatic drainage of penis:

- Prepuce & penile skin → dorsal lymphatic → Divide at base → Sup. Inguinal nodes
- Glans & shaft → Trunk at corona → deep to busk fascia upto base
 - Bilateral Inguinal LN
 - Then pelvic LN
 - Significant cross over
- Urethra: Anterior urethra: deep inguinal LN
- Mems / post → Int. Iliac

❖ Penile lesions with viral etiology:

- Kaposi's sarcoma
- Buske lowenstein tumor
- Condyloma acuminata
- Bowenoid papulosis

❖ Role of initial biopsy in Ca penis:

- To confirm diagnosis
- Grading of lesion
- Depth of invasion
- LVI

❖ Why wedge biopsy for Ca penis?

Take some normal tissue to allow optimum evaluation of depth of invasion.
Biopsy from centre of lesion → comes to have more necrotic tissue

❖ TNM Staging:

AJCC 2017, 8th edition staging

- Tis: Carcinoma in situ
- T_a: Non invasive localized Ca
 - I. Locally destructive verrucous Ca penis in PT₁ → previous edition**
 - II. Previous edition doesn't have any inclusion for perineum invasion**
- T₁: Invades lamina propria
 - PT_a: No LVI
 - No Perineural invasion
 - No G₃
 - PT_{ib} LVI / Perineural invasion or G₃
- T₂: Corpora spongiosum with / without urethra
- T₃: Corpora cavernosa with / without urethra
 - III. Previously T₂ may involvement spongiosum / corpora without urethra**
- T₄: Involvement of adjacent structures
 - Prostate, Scrotum
- PN₁ ≤2 lymphnodes No ENE
 - IV. Previously only single LN in PT₁**
- PN₂ ≥2 unilateral or bilateral Np ENE
 - V. multiple >2 in this category**
- PN₃ ENE or pelvic LN

❖ **Risk stratification for Ca Penis:**

- Very low risk: Tis, T_a < 5% LN involvement risk
- Low risk: T₁G₁ <16%
- Intermediate risk: No LVI 16-45%
Superficial spraying type
T1a G2
- High risk > T₁b
Nodular growth >68%
Any LVI

❖ **Perineal involvement:**

Microscopic front pattern of invasion
Are independent prognostic factor for Ca penis

❖ **Indication for neo adjuvant chemo treatment:**

1. Bulky >4cm size LN [NCCN]
2. Pelvic LN **Pagliari study**
3. Fixed LN ↓
4. Bilateral Bulky LN 50% objective improvement

❖ **Adjuvant chemo treatment:**

1. > 2 positive LN
2. ENE
3. Bilateral LN involvement
4. Pelvic LN involvement

Pizzacaro study: 5 years survival good
Relapse rate decrease

❖ **Chemotherapy Regimen:**

- **TIP Regimen:** Paclitaxel : 175mg/ml day 1
Cisplatin: 25mg/ml 1-3 days
Ifosfomide: 1200mg/ml 1-3 days
- **5 FU + Cisplatin: Old Regimen**
Cisplatin: 100mg/ml on day 1
5 Fu: 1000mg/ml day 1-5
No second line regimen

❖ **Radiotherapy for LN in Ca Penis:**

- **Prophylatic for LN (No):**
No role
Inaccurate staging
Lack of HPE
- **Adjuvant:** Multiple nodes
ENE
Decrease local recurrence
- **Palliation:**
Fixed groin
Ulcerative LN
Bone mets



No role for pelvic LN RT
T₃₋₄ or N⁺ unresectable
45-50Gy to penis + Inguinal region

❖ D. Adv of RT

- SCC are primary radio-resistance
- High dose needed
- More local complications
- Difficult to differentiate between recurrence or fibrosis
- Inferior results then surgery

❖ **Brachy Therapy:**

- 2 or 3 parallel plan of source
- 12-18mm distance
In 2x2, 3x3, 2x3 arrangement
- Brachy therapy superior to EBRT
Progression free rate: 80%

❖ Pre requisite for RT: **Circumcision:**

- To provide proper dosage
- To avoid phimosis
- To avoid radiation balanitis

❖ **Complication of RT:**

- Early:
 - Desquamation
- Late:
 - Meatal stenosis
 - Soft tissue ulceration
 - Sexual dysfunction
 - Hyper pigmentation of penis
 - Recurrence of lesion

❖ **Role of FNAC in C/o Palpable LN:**

1. High Risk Patient:
 - Doesn't change management protocol. Even if it comes negative.
 - But it positive then for prognosis purpose.
 2. Intermediate / Low Risk:
 - Positive do I/L IFLND
 - Negative then → Excisional Biopsy
- 93% sensitivity if LNs are palpable.

❖ Importance of fixity of LN:

- Fix LN mostly due to extranodal extension and periadenitis which leads to fixity to skin.

❖ **Modified inguinal LN dissection in case of negative groin known as prophylactic LN dissection**
As even though LNs are negative we do it for prophylactic purpose and proper staging.

❖ **LN dissection and penile surgery are always staged**

- To decrease infection risk
- If we do combine can increase complication and morbidity.

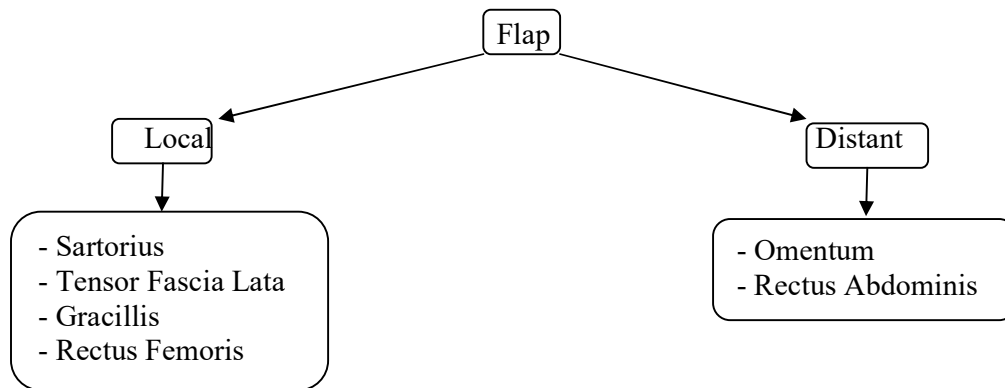
(I have asked too many examiners for this, all were in opinion for stage the procedures. It is safe answer for exams)

❖ **Indication for Flap:**

- Dissection of fixed and fungating LN
- Post RT
- Wound dehiscence
- Very large defect
- Closure under tension

❖ **Adv. of Flap surgery:**

- Healthy tissue for healing
- No tension for closure
- Reduce dead space / scroma
- Post procedure RT can given
- Decrease hospital stay



❖ **Sartorius:**

- Type 4 flap
- Multiple supply
- Perforators from sup. Femoral artery

❖ **Gracillis:** Type II dominant + minor supply
Ascending medial circumflex artery

❖ **Tensor Fascia Lata:** Type I (Single Dominant)
Ascending branch of lat. Circumflex artery

❖ **Rectus abdominis:** type III (two dominant) Sup. Epigastric Artery
Inf. Epigastric Artery

❖ **Rectus Femoris:** Type II

Penile Preserving Surgery:

Rationale:

- 55% of patient with Ca penis are of <55 years
- Surgical amputation at expense of loss of sexual life



Indication:

1. Low and int. risk patient
2. Mass < 4cm
3. Mostly on glans

If spongiosum and urethra involvement then C/I for PPT

Modalities:

- Circumcision
- 5 FU / podophylin crum
- Laser
- Brachy treatment / EBRT
- Glansectomy
- Glans-Resurfusing

Laser:

CO₂ & Nd: Yag laser

Nd: Yag: 6mm penetration

T_{is}, T₁ lesion

❖ Local tumor management doesn't depends on inguinal LN status**❖ Duplay classification** for anatomical variation of penile blood supply:

Type I: Extensive supply from int. iliac (A)

Type II: Supply from accessory + Int. pudendal artery

Type III: Supply from accessory arteries

❖ Indication for Radical Panectomy:

- **Proxymal penile sarcoma**
- **Metastatic lesion**
- **Aadvance urethral Ca**

❖ Total Panectomy: Penis is removed upto suspensory ligament. So total panectomy is misnormal. while in **Radical Panectomy:** Corpora are dissected upto ischiopubic rami.**❖ Type of urethral reconstruction** after Total Panectomy:

- End urethrostomy:
Urethra mobilization from surrounding corporas and inverted ∩shape incision.
- Ventry Flap Stomy:
∩ Shape incision
No mobilization of urethra
Flap raised and anastomosis done

❖ Abnormal findings of LN on USG:

- **Increase size of LN**
- **Increase vascularity of LN on Doppler**
- **LN necrosis**
Hyper Echogenicity
- **Abnormal shape**
- **(-) nt of echogenic hilum**

❖ DSLNB: Popularized by Netherlands Cancer Institute

Detection of lymphnodes by using vital blue and radio active tracer

❖ How to do DSLNB?

- Prior to DSLNB do USG of LN

- Lymphosatiography with 0.3 – 0.4ml Tc⁹⁹ colloid around lesion
- 4 hours prior to surgery
- And in OT using isosulphan blue 1ml intra dermal at penile base.
- Small inguinal incision
- LN biopsy on basis of blue coloured LN or gama probe.

False Negative:

- Poor sectioning
- Tumor obstructing LN
- Wrong selection of LN

❖ **D.Adv of DSLNB:**

- Costly
- Training of DSLNB
- Expertise needed
- False positive rate 7%

False negative rate was 18% now decrease upto 7%

❖ **How to improve results of DSNLB?**

- **Prior USG**
- **Routine 2mm section of LN**
- **Use of IHC**
- **Exploration of groin if no signal acquisition**
- **Combine use of dye and radio-tracer**

❖ It is recommended to do at centres which performed 20 or more cases of DSNLB a year.

❖ **Incision of Radical Ilioinguinal LND:**

Parallel to inguinal ligament

As vascular supply in direction from lateral to medial and deep upto camper fascia

As LN are below this fascia. So it has to be presented in LND

❖ **Post operative care for Radical Inguinal LND:**

- Bed rest for 2-3 days
- DVT prophylaxis
- Remove drain after drainage <50cc
- Prolonged antibiotics
- Look for dressing and necrosis if happens
- But now trends towards early ambulation.

❖ **How we can reduced complications:**

- Closure without tension
- Drainage
- Prolong antibiotics
- Usage of flap if necessary
- Bandage
- Creating proper flap containing camper's fascia.

❖ Removal of 16 or more LN improves disease survival.

❖ **VEIL: Video Endoscopic Inguinal Lymphadenectomy:**

Popularized by Tabies Machado

Position: Split leg or low lithotomy

Draw inverted triangle

Base: ASIS to tubercle

Lateral Sartorius

Medial Add longas

Put 2cm incision 3 cm away from apex

OR

25cm from inguinal ligament

2 8mm port 8cm with 25cm h₂O for 10 minutes – pneumo creation

Inguinal ligament appears as white line

Identify muscles by overlying fascia

Superficial & deep LNs are removed separately.

Closed suction drain kept

❖ **Premalignant lesions of Ca Penis:**

- **Probably Associate:**

- BXO
- Cut. horn
- Bowanoid papulomatosis

- **Highly Associate:**

- PIN grade III
- Keratitis balantitis
- Bowen's disease
- Erythroplakia
- PEMB
- Paget's disease

Q: what is the presentation age of Ca penis?

A: 50-60 y, 6th decade

Q: What is etiology of Ca Penis?

1. Improper Hygiene
2. Phimosis – M.C.: 6,8 Malignancy: 16,18
3. HPV infⁿ (HPV-16) HPO associated with 70-100% CIS, 30% invasive CA penis
4. Tobacco Products → smoking is a leading risk factor
5. Penile trauma / tear
6. BXO
7. multiple number of sexual partners
8. Treatment with PUVA / phototherapy ← Psoralen ultra violet

Q: what is the role of neonatal circumcision?

A: protective (only if done in neo-natal period) , reduces the risk 5 times

DOES NOT protect against CIS under Ca penis, under UTI, under HIV/STD

Q: How much risk is reduced by neonatal circumcision?

A: 5 times

Q: what populations practice neonatal circumcision?

B: Jews & Muslims

Q: what are the other advantages of circumcision?

A: reduces the chances / risk of STDs

Q: what is the counterpart malignancy in female due to HPV infⁿ?

A: Ca Cervix

Q: how does HPV-16 causes Ca-Penis?

A: HPV 16 → Oncoprotein E6 → Binds to P₅₃
→ Oncoprotein E7 → Binds to Rb Gene } leads to cell-cycle-Dys regulation

Q: What will you ask is history?

A:

- H/O multiple sexual partners
 - H/O partner having Cervicitis
 - H/O Barefoot walking → ing L.N.
 - H/O phimosis, circumcision
 - H/O local application of any medicine, oil.
- Pain not supporting in ca penis
Weakness weight loss
Muscle carnexia,

Q: what will you see in local Examⁿ?

A:

- Size of glans, BXO changes , penile shaft, , Prepuce, corona sulcus, Testis
- Ulcer-size, site-shape, base, floor, edges ,discharge
- Ing LN s

Q: what is the incidence of Ca in BXO pt?

A: 5-10 %

Q: How can you prevent Ca-Penis?

A:

- Routine neonatal circumcision
- Good Hygiene – if good hygiene then no need for circumcision
- Avoid HPV
- Condom
- Avoid Tobacco
- HPV vaccine

Q: what is Gardasil / cervarix?

A: HPV vaccines

- 1st dose = @ puberty = 13 yrs
- Booster = @ marriage = 26 yrs



Q: how can Ca-Penis Present?

A: Exophytic / ulcerative / ulcero proliferative

Q: what are the exophytic lesions of penis?

A:

1. Condyloma acuminata
2. Bushke lowenstein tumour
3. Keratotic Balanitis
4. Pseudo epithelial micacious
5. Ca-penis

Q: what are ulceroproliferative lesions of penis?

A: all above

Q: D/d of genital ulcers?

A:

- chancre- syphilis –T- palladium
- Chancroid – H.Ducreyi
- LGV - Chlamydia
- Herpes – HSV-II
- TB- TB

Q: which has poor prognosis- ulceration or proliferative growth?

A: ulcerative, : because more chances of mets

Growth rate of

Q: what is the most imp Barrier to invasion?

A: Bucks fascia

Deep dorsal nerve / artery runs deep to bucks fascia

Q: what are layers of Penis?

A: Skin, Dartos, Bucks, Albuginea, corpora

Q: what is the most imp prognostic factor?

A: LV Invasion, Grade of tumour

Perineum invasion

Q: What is the mode of spread & sites?

A: the mode of spread -Lymphatic

Sites -To femoral & iliac nodes

Q: what is the cause of death in Ca penis?

A:

1. Cachexia
2. Sepsis
3. Chr. Infⁿ
4. Femoral vessel erosion

Q: What are the distant mets sites?

A:

- lung ,
 - liver,
 - Bone,
 - Brain
- } involvement is very rare 1-10%

Q: Can distant mets occur in the absence of LN involvement?

A: NO

Q: what is the prognosis if patient is not treated?

A: death within 2 yr

Q: what % of pts have S.C.C?

A: 95% of penile malignancies are S.C.C

Q: Can ca penis spontaneous remit?

A: No

Q: what are the common growth patterns?

A: Papule → Warty growth → nodules → Exophytic growth
Or

Flat desquamation + Ulcer → deep excavated

Q: where can there be skip L.N involvement i.e. pelvic L.N. involved & inguinal L.N not involved)?

A: Usually rare, in cases of involvement of corpora cavernosa & urethra, there can be skip lesions

Q: what are the pre malignant cond"?

- A. Keratotic Balanitis
- B. BXO
- C. Cutaneous Horn
- D. Pseudo epitheliomatous keratitis
- E. Leukoplakia

Q: what is the distribution of ca – penis?

A:

- Glans 48%
- Prepuce 21%
- Coronal sulcus 16%
- Shaft 2%

Q: what are 'B' symptoms in ca penis?

A: weakness fatigue, malaise

Q: will you DRE in a pt of Ca penis?

A: yes,

- State of perineal body
- Prostate assessment (old age pt)



Q: how will you clinical assess pelvic L.N?

A To see for pelvic lymph nodes –internal Iliac and Obturator do bimanual examⁿ (same as for TURBT)

Q: What will you do next?

A;

- Basic routine Blood & urine Ix
- Coagulation Profile (do only if there is any bleeding tendency /history.
- Fl/by edge-wedge biopsy

Q: What will you see in Biopsy report?


A: Grade of tumour, LVI, Depth of invasion, type of Ca

Q: what If biopsy is negative?

A: repeat biopsy with multiple sites wedge biopsy

Q: what is Cubilla classification?

A: Classification of Histological types as

- 1- Usual type → 60% → Superficial spreading
 - 2- Papillary - 15%
 - 3- Basaloid - 10%
 - 4- Warty – 10%
 - 5- Verrucous – 10%
 - 6- Sarcomatous- 03%
- Aggressive
- Non invasive
- 

Q: what is the imp of depth of invasion?

A: more depth of invasion → more chances of nodal mets.

Q: what are the most important factors in Biopsy report?

A:

- LVI (primary invasion)
- Grade of the tumour

Q: What do you expect on lab Investigations?

A:

- Anemia
- Leucocytosis
- Hypoalbuminea
- Derranged RFTS → Ureteric Obstn
- Hypercalcemia → part of para-neoplastic syndrome (20%)
- Increase PTH → para-neoplastic syndrome

Q:What does Hypercalcemia depict?

A: Bulky disease, / mets, / micromets

After cure hypercalcemia should come to normal

Q: what will you as next Investigation?

A: USG penis (penile USG -7.5 MHz)

- For corpora cavernosal invasion



Q: what is the USG appearance of Ca penis?

A: Hypo-echoic

Q: What all urological malignancies can produce hypercalcemia?

A: RCC, Ca penis, TCC (virtually all malignancies can cause increase Ca^{++} due to PTH-RH Release)

Q: What are the dyes for DSLNB (Hornblass)?

A: Isosulphan Blue, ^{99}Tc nano colloid sulphur

Q: what are the indⁿ for USG / MRI penis?

A:

- High suspicion of cavernosal involvement
- Thinking of penis sparing Sx
- Equivocal physical findings

Q: what will you do if inguinal L.N. are palpable?

A: CECT abd +penis if inguinal L.N are palpable, to assess pelvic LN.

Q: What is the role of FDG-PET?

A:

- Can pick up inguinal mets its but role is not established.
- Doubtful mass on CECT
- In cases of Hypercalcemia with few L.N. (where hidden mets disease is suspected to be cause of increase Ca^{++})

Q: What are distant mets sites?

A: Lung, Bone, Liver.

Q: What is Jackson Staging?

A:

- 1- Only glans & prepuce involvement
- 2- Growth on shaft
- 3- Mobile L.N
- 4- Fixed L.N.

Q: where will you look for nodes in CECT?

A: Anterior to femoral vessels (just below skin)

L.N will enhance in CECT

Q: What is this staging / classification for ca penis?

A: AJCC → Roughly similar to Jackson's staging

Verrucous Carcinoma: also known Buschke – Lowenstein Tumour

- Lower grade variant of S.C.C
- low metastatic potential
- Caused by HPV-6
- Large fungating mass
- On glans, oral, nasal mucosa
- Mx – excision

Q: How will you manage Ca penis of different stages?

A:

- Low grade (G1,G2), Low stage (T1s, Ta, T1) = penile preserving
- T₁G₃ / T2-T4 = penile amputation – partial / complete
- L.N. palpable: Inguino pelvic dissection
- Mets : chemo (neo- adjuvant)

Q: what will you do for CIS?

A: 5 –fluorouracil

Imiquimod cream;

- immune response modification
- Put the cream in condom and wear the condom for 30 min
- Causes extreme discomfort, pain, itching, & scarring.

Q: What can you do for T_a / T₁?

A:

- Radiation Rx
- Laser ablation : NDYAG (6mm depth, 1060 nm, 7% recurrence rate
- Mohs micrographic Sx (Mohs was general surgeon – 1938)
- (now a day's excision with frozen section has replaced Mohs s_x ,try to avoid saying Mohs surgery in exams as no one does it now)
- Circumcision for prepuccial skin involvement

Q: when can you do partial penectomy?

A: Usually for lesions of glans & corona

Q: How will you complete penectomy?

A: lesions involving corpora cavernosa; urethra

Superficial lesions near the base of penis when adequate margin cannot be left behind.

Q: What lasers can you use?

A: CO₂ – 0.1 mm depth – not sufficient

NDYAG – 6mm Best with concomitant negative frozen section

KTP – 4mm

Q: what is the advantage of laser?

A: Cosmetic

Sexual activity – preserves Glans Sensation

--Preserves length of penis

Q: When will you advice penile amputation?

(A) T₁ G₃, T2, T3, T4

Q: what are the two most imp prognostic factors?

A: LVI, nodal involvement, grade of tumour

Q: what is the Prognosis of Ca- Penis?

A:

- Without LN, 5 yrs survival > 80%
- With LN 5 yr survival , with treatment = 60%-80%
- With LN 5 yr survival ,Without Rx → 0.5%

Q: How can you predict that given palpable node is involved or not?

A: High chances for a palpable L.N. to be positive if...

Nodal characters

- Hard, fixed , >= 3cm
- Persistent after antibiotic course

Tumour characteristics

- High grade, LVI+,
- High stage

Q: what will you do for palpable LN?

A: FNAC of palpable L.N. espl if grade of tumour is G1, G2, Gx (low risk) (EAU guidelines)

Q: what % is false negative of FNAC?

A: 20-30%

Q: what will you do for high risk Ca-Penis with mobile palpable unilateral LN?

A: if the L.N. is positive for malignancy on FNAC or the case falls in high risk group, I will do Ipsilateral ilio-Inguinal dissection + (contralateral superficial dissection + frozen Section)

Q: what are the disadv of inguinal dissection?

A: Morbidity

- Pulm embolism
- Wound infⁿ
- Flap necrosis
- Lymphodema

Q: What is Chemosurgery?

A: Moh's micrographic sx is also known as chemosurgery

Q: How will you do sartorius slide?

A: Detach sartorius from ASIS and re-suture to inguinal ligament

Q: What are the famous Indian studies w.r.t. LN involvements in ca penis?

A: Ravi et al } depicts 5yr survival & compln of ing LN dissection
Srinivasan et al }

Q: How will you fl/up the pt on surveillance low risk pt [i.e.-- T_{1s}, T_a, T₁G₁]?

A: 1st-2nd yr @ 3 mo → Phy examⁿ & CBC
3rd-4th yr @ 4-6 mo → Phy examⁿ & CBC
After 5th yr annually → Phy examⁿ & CBC

EAU

The components of fl/up examⁿ are phy examⁿ of penis & groin & .CBC



Q: Who described sentinel LN?

A: Cabanas

Q: what is Cabanas LN?

A: Supero medial group of Daseler's

Q: what is superficial Ing dissection?

A: removing the inguinal nodes above Fascia lata

Q: What is deep ing dissection?

A: removing the inguinal nodes below fascia lata contained within femoral triangle.

Q: What is pelvic dissection?

A: removing the External iliac, internal iliac & Obturator group of lymph nodes.

Q: What are the boundaries of femoral Triangle?

A:

- Medially – adductor longus
- Laterally – sartorius
- Superiorly – inguinal Ligament

Q: What are the contents of Femoral Triangle?

A: F. Nerve, F. Artery, F. Vein, NAV ↔ VAN

LN → Cloquet LN → also known as “Rosenmullers LN”

The lymph node is in canal → femoral Canal

Q: what is the name of modified inguinal dissection?

A: Catalona opⁿ

Q: will you do unilateral or bilateral dissection inguinal lymphadenectomy?

A: bilateral

Q: when will you do unilateral ing lymphadenectomy?

A: when unilateral single L.N. appears 6 months or after the initial penectomy.

Q: what will you do if pt is high risk and no nodes palpable?

A: B/L superficial inguinal dissection & frozen section

Q: what if unilateral mobile node (high risk)?

A: ipsilateral complete dissection (superficial and deep inguinal dissection with pelvic lymph node dissection) + contra lateral (C/L) superficial inguinal dissection.

Q: what if B/L mobile palpable LN?

A: Do FNAC first → +ve → then

- Option 1...B/L ilioinguinal complete dissection+ Adj. chemo

Option 2...Neo adj chemo + B/L ilioinguinal complete dissection

Q: what will you do if nodes are fixed?

A: give chemo cisplatin + 5 FU x 3 cycles (after penectomy & but before inguinal dissection)

↓
Re assess

↓
If resectable - Aggressive resection

If non resectable- continue chemo

Q: what are the side effects of chemo?

A: Cisplatin

- Nephrotoxicity
- BMD bone marrow depression
- Oto-toxic
- Peripheral neuropathy

5FU

- Stomatitis, Gastritis
- Nausea, Vomiting, Diarrhea(NVD)
- Radio sensitizer

Q: if the inguinal LN mass is not regressing after chemo; what next step will you do?

A: Put endovascular stent in femoral artery, fl/by chemo/radio

Q: what are the problems with frozen section?

A:

- False negative→ problem comes due to freezing of tissues in cryostat and thus cellular architecture is lost
- Operative delay
- Cost
- Not readily available

Q: what will you do if there is femoral erosion & oozing?

A: it is usually arterial blow out and vein is usually thrombosed

- Option 1: Tie it in continuity above inguinal ligament
- Option 2. Endovascular stent fl/by chemo + radio therapy

Q: How will then Blood circulation be maintained to lower limb?

A: by profunda femoris artery via superior gluteal artery

Q: what are the complⁿ of tying the femoral artery?

A:

- Gluteal claudication
- L/L claudication and Ischemia

Q: How will you give XBRT?

A: Prone position, penis hanging through a hole (in lead plate) into water bath

- 60 Gy in 30 Fractions x over 6 wks
- 70 Gy in 7 wks



Q: How are the oncological outcomes?

A:

- Oncological effects are inferior to surgery Sx
- More chances of Mets as delay / slow Mx
- Cosmetic appearance is good

Q: how else can you give radiotherapy?

A:

- Plastic mould Block brachytherapy using Iridium 192 (m/c) or Radium 206
- Seed implant in Pre drilled template
- Dose 60 Gy over 10 days
- Faster therapy → decreases the chances of mets

Q: what are the contra- indⁿ to radiotherapy for primary penile lesions?

A:

- Tumour > 4 cm
- High grade tumour
- Involving corpora / urethra
- H/O penile / urethral reconstructive / stricture Sx

Q: Is there any role of radiotherapy in inguinal LN?

A: some role as palliative procedure or multimodality approach for fixed nodes

Q: Is penile necrosis more after XBRT / Brachy radiotherapy Rx?

A: after Brachytherapy

Q: Is sq cell Ca, radio sensitive?

A: no, it is radio resistant

At very high doses (60 Gy) it gets destroyed by Radio Rx.

Q: What is peculiar dis-adv of Radio Rx?

A:

1. Examⁿ of Inguinal Region becomes difficult
2. Slow treatment so more chances of mets
3. Urethra-cutaneous fistula, infertility

Q: what are the indn for laser Rx?

A: T_{is}, low grade T₁ G₁, T₁ G₂

Q: what is the time required for Healing after laser?

A: 12 wks

Q: what is the safe margin for partial penectomy?

A: older belief 2 cm (1-2cm)

Now a days 5mm for low grade cancer and 10 mm for high grade cancer is sufficient.

Q: what is the recurrence rate after partial penectomy?

A: Upto 8%

Q: How many LN are there in superficial Ing region?

A: 5-25 LN

5 groups of Dessler's LN

Q: what are the 5 Dessler's group of LN ?

A;

- Central group → around saphenofemoral Jn
- Supero lateral → around superficial circumflex vein
- Infero lateral → around Lat femoral cutaneous vein
- Supero medial → around Superficial epigastric
- Infero medial → around great saphenous vein

Q: what are deep Ing LNs?

A:

- they are deep to tensor Fascia lata
- Few in numbers 4-6
- Lie primarily medial to femoral vein
- Cloquet is the most cranial of this group

Q: Where is Cloquet (also called Rosenmuller's LN) LN situated?

A:

- Medial to femoral vein
- Situated B/w femoral vein & lacunar ligament

Q: which pelvic LNs will you remove?

A: ext. iliac, int. iliac, obturator group of LN

Q: which is more superficial camper fascia or scarpa fascia?

A: Camper is more cutaneous/ superficial

'C' comes before 'S', Camper comes before Scarpa during dissection

Q: where will you dissect skin flap?

A: camper fascia contains the arborizing plexus for skin so camper fascia goes with skin & dissection goes b/w camper & scarpa.

More over lymphatics run in scarpa → so remove it along LNs during inguinal dissection.

For thick flaps → take scarpa along with skin flap so that skin thick flap is achieved.

Q: Why horizontal /transverse skin incision is made?

A: Blood supply in groin is medio ↔ lateral, so horizontal /transverse skin incision is made.

Q: what is fn of femoral Nerve?

A: Quadriceps femoris } motor supply

Sartorius muscle }

Cutaneous anterior thigh – sensory supply



Q: what is the floor of femoral triangle?

A: Pectineus muscle- Medically
Iliopsoas – laterally

Q: what is the land mark for S.F Jn?

A: 2 finger breadth Infero-lateral to pubic tubercle.

Q: what are the indⁿ sentinel lymph node Biopsy?

A:
1. High grade ca penis with non palpable LN
2. High stage ca penis T₂/ T₃ with non palpable LN(N₀)

Q: what are components of modified dissection or Catalona Opⁿ?

A:
1. Shorter skin incision
2. No need to go Lateral to femoral artery
3. No need to go caudal to fossa ovalis
4. Leave intact saph. Vein
5. Elimination of need to transpose the sartorius

Q: What are the complications of Catalona opⁿ?

A:
1. Seroma
2. Wound infⁿ
3. Skin necrosis
4. Lymphedema

Q: what are the indications for radical ilio-inguinal lymphadenectomy?

A: indⁿ:-
• tumour high grade + palpable LN
• tumour any grade with FNAC +ve LN

Q: When will you do inguinal dissection – along with penectomy or later?

A: usually 6 wks after partial / complete penectomy

If LN dissection is done along with penectomy then penectomy in same sitting → operative site will not heal because of the backload oedema & swelling of the penis. Hence some time gap is required.

Q: what are boundaries for radical ‘ilio inguinal LN dissection’?

A:
• Superior--line joining ASIS to pubic tubercle
• Lateral--Drop 20cm vertical from ASIS
• Medial--Drop 15 cm vertical from pubic tubercle.
• Inferior—join the lower ends of the medial and lateral lines

Q: How will you cover femoral vessels in radical ‘ilio inguinal LN dissection’?

A: sartorius slide flap
Detach sartorius from its origin (ASIS) and transpose & fix to inguinal ligament.

(Q) Suppose skin edges are not able to approximate then how will you close the defect in radical 'ilio inguinal LN dissection'?

A:

- Non tension suturing
- Skinner flap –(scrotal rotation flap)
- Abd wall flap (taba-taba-ei flap)

Q: what if penile growth biopsy report comes as Basal cell Ca?

A:

- Very rare
- Sun exposed areas
- On shaft
- Excision is complete cure
- Does not metastasize

Q: what if penile growth biopsy report comes as melanoma?

A:

- Rare
- Sun exposed areas
- Glans mostly

Q: How will you stage melanoma?

A: Clark's staging – according to depth of invasion (according to mm_s)

Breslow staging – according to thickness of tumour (according to Biopsy layer)

Sanchez Ortiz staging – combination of both above.

Q: How will you manage melanoma?

A:

- Stage I: (localized lesion) = excision of primary tumour is adequate
- Stage II (mets to one regional area) = excision of primary with 1cm margin + excision of LN mets (B/L) + chemo (cisplatin/Paclitaxel/ Ifosfamide/ PIP)
- For advanced tumour Clarks stage IV & V Breslow thickness >1mm → partial penectomy + Bilateral (B/L) inguinal modified dissection + chemo.

Q: what if penile growth biopsy report comes as sarcoma?

A:

- usually of vascular origin FI/by neurosarcoma, fibro sarcoma
- Sarcoma classification → superficial → integumentary supporting structures
→ Deep → from corporeal body (deep to bucks fascia)
- Mx – superficial sarcoma – small- less than 2 cm → local excision
Superficial sarcoma – large – size more than 2cm → partial Penectomy
Deep sarcoma – any size – partial penectomy
- Local recurrences are common
- No need of nodal dissection if no LNs are palpable.

Q: How will you resect Paget's disease?

A: 3 cm margin with frozen section.

Q: what if penile growth biopsy is Lympho reticular malignant neoplasm?

A:

- usually Leukemia
- Mx – medical Mx- chemotherapy

Type of tumour	Primary Mx	L.N dissection
Basal cell Ca	Wide excision >2cm margin	-no need
Melanoma	Excision	Must for high grade
Sarcoma	Excision	Only if palpable
Pagetoid	Wide excision >3cm margin	No need
Lymphoreticular tumour	Medical Mx	No need

Q: what other organ malignancies can metastasize to penis?

A: Bladder, Prostate, Rectum

Q: what are the routes of spread of mets to penis?

A:

- Direct extension
- Lymphatic
- Arterial, venous

Q: what are signs & Mx for metastatic involvement of penis by remote primary?

A: sign: priapism, penile nodularity,
Mx- Partial / complete penectomy

Q: what is PIPE Test-MRI?

A: Papaverine induced penile erection Test

- MRI is done after penile erection to correctly stage the local tumour
- In a study from Italy PIPE-MRI is found superior to clinical Examⁿ for staging localized penis.

Q: who described DSLN biopsy?

A: Dynamic Sentinel lymph node biopsy by Hornblass
DSLN biopsy is not available in INDIA

Q: what is VEIL?

A: Video Endoscopic Ing Lymph node dissection.

Q: what are the Indⁿ for Radiological examination (USG / MRI) of groin in Ca – penis?

A: For inguinal assessment in

- Obese pts
- pts with doubtful examination
- Post op / post radiation.

Q: What is the status of USG in Ca – penis?

A:

- helpful for USG guided FNAC (inguinal Region)
- for detection of corporal involvement (local invasion)

Q: What can be the second line chemotherapy in ca penis?

A: not established--5FU/ Cisplatin / Docetaxel anyone can be used.

Q: what is penile carcinoma –in-situ known as?

A:

- Erythroplasia of Quelet (EQQ)– on glans, prepuce
- Bowen disease :- on shaft

Q: Can CIS progress?

A: yes, to high grade in 10-30% cases which leads to invasive tumour.

Q: what is the gross appearance of Bowen's disease?

A:

- Scaly erythema on penile skin, crusted (ulcerated variants may also be there)

5-10% of conversion to invasive Ca.

Q: what is the gross appearance of EQQ?

A:

- Red velvety patch
- Well define margins
- Associated with discharge
- .

Q: what is the Mx of Cis?

A: Bowen's disease – excise (5mm margin)

For glans lesions (EQQ)

- 5% Imiquimod cream
- 5 FU cream
- Laser ablation with NDYAG, KTP
- Radiation therapy

Podophyllin

- Available in India
- As podowart-S paint
- Podowart – podophyllin + Salicylic acid
- 10ml = Rs 75/-

Imiquimod

- Available in India
- As nilwart (Dr. Reddy's lab)
- Rs. 205/- per 10gm tube

(Q) What are the d/ds for ca penis?

(A) D/D of Ca penis

- Chancre
- Chancroid
- Condyloma accuminatum
- Herpes
- Apathus Ulcer
- Lymphogranuloma venerum
- BXO
- Buschke Lowenstein tumour
- TB ulcer

Benign disease	Causative organism	characteristics	Investigation management
Warts:	HPV infn	Usually painless but may be painful	Mx- Imiquimod cream Podophyllin appl ⁿ cauterization Liquid-nitrogen Laser ablation
Chancre	Due to syphilis (T-Pallidum)	Painless ulcer Hard edges Non exudative 1-2cm lesion	Ix- dark field exam ⁿ VDRL Mx- Penicillin
Chancroid	H-ducreyi inf ⁿ	Painful ulcer Soft chancre Ulcer forms within 10 days of infn L.N +ve	Ix- ELISA Mx-Antibiotics
L.G.V	Chlamydia	Suppurative lesions of inguinal LN 1 ^o – genital ulcer (3-10 days) Secondary – LN +ve → (10-30 days)	Ix- complement fixation Reaction Mx- Doxy, Tetracyclin.
Condyloma Acuminata	Due to HPV 6,11 (Ca penis – HPV – 16)	Viral disease Genital warts It is a STD	Mx – Podophyllin cream (podowart) Imiquimod cream Laser Liquid nitrogen Cauterization

Genital Herpes	viral disease Caused by HSV HSV -1 above the waist HSV – 2 below the waist	Ulcer occurs within 1-2 weeks of sex Painful , Burning, itch	Mx- acyclovir, Famcyclovir
TB penile ulcer	- Occurs as Primary TB lesion	Painless ulcer with excavated margins	AKT
Buschke lowenstein tumour	Same as giant Condyloma	Same as Verrucous carcinoma	

Q: what is a wart?

(A)

- warts are small whitish lesions, rough blister
- Typically located on human hands, feet
- Usually painless; but occasionally painful
- Caused by H.P.V virus (HPV-11,6)
- If these warts appear on genitals they are called condylomata acuminata.
- Prevention – Gardasil
- Rx
 - Imiquimod cream (moderates the immune system)
 - Laser ablation
 - Cautrization
 - liquid nitrogen cryotherapy
- “Verruce” means “ warts” in latin
- “verrucous” means covered with wart or wart like projections.

Q: what is a Buschke Lowenstein tumour?

- Same as = VERRUCOUS Carcinoma = giant acuminata (also called Snuff – diaper’s cancer)
- Carcinomatous growth covered by warts or in the form of warts
- Low grade malignancy
- Also Known as giant Condyloma acuminata (i.e., Condyloma acuminatum which is giant)
- Pre malignant lesion; due to HPV
- Mx of Buschke lowenstein tumour-Surgical excision

Q: what is a Condyloma Acuminata?

- “condy” → sex/ Genitals
- Condylomata → multiple condylomas
- Condyloma acuminata : Genital wart due to virus HPV-6,11
- Also called venereal warts
- Type : STD
- Organism: HPV virus
- Status : contagious
- Location: tip of penis (corona)
- Growth: small warts appear as clustered growth and eventually confluence to form big growth
- Mx: podophyllin, Imiquimod (nilwart), laser liquid nitrogen Cautrization, 5 FU.

Q: what is a Chancre: (pronounce= shangkar) (French = little ulcer)?

- Painless ulceration
- Usually due to syphilis (primary)
- Appears 21 days after exposure (sex)
- T.Pallidum (spirochete)
- Size 1-2 cm
- On anus, penis, moth , vagina
- Ix: dark field exam / antigen- Haemagglutination, VDRL- Antigen
- Mx : penicillin

Q: what is a Chancroid?

(A)Chancroid: (means – like chancre but not exactly chancre)

- Soft chancre
- Painful chancre
- STD
- Caused by H.Ducreyi (bacteria)
- Erythematous papule → Pustule 4-7 days → ulcer 8-10 days
- Size :1-5 cm

Irregular, ragged, undermine borders

With painful / tender lymphadenopathy, Ing lymph nodes

Swollen L.N are buboes.

- Ix- ELISA
- Mx: Erythromycin, Azithromycin

Q: what are the Differences between chancre & Chancroid?

A:

Chancre:

- Painless
- Syphilis (T-Pallidum) ,
- Ulcer @ 21 days
- Non exudative
- Hard edge
- May heal spontaneously in 6 wks

Chancroid

- Painful
- H.Ducreyi (Bacteria)
- ulcer @10 days
- Pus exudates
- Soft edge
- Grows, if not treated

Q: what is a Herps (genitalia)?

- Genital herpes
- HSV-1 above the waist, HSV – 2 below the waist
- Appear as clustered vesicles on outer surface of genitals (glans)
- 4-7 days after sexual exposure (vesicles)
- Painful, itching, burning
- Ix- viral culture
- -Biopsy
- Mx: Acyclovir famcyclovir

Q: what is alcocks canal?

A:

- It is also known as pudendal canal
- It is a fascial compartment on the lateral wall of ischiorectal fossa containing pudendal arteries, pudendal veins & pudendal nerve
- Alcock canal syndrome leads to pain in sitting position & delayed bulbocavernous reflex

Q: what are the layers of penis?

A:

- A- Albuginea
 - B/C -Bucks fascia
 - -circulation
 - D -Dartos
 - E -Epidermis / skin
- } inside
↓
Out

Q: what is perineum & its Boundaries and parts?

A: Perineum is the diamond shaped space lying below the perineal diaphragm

Boundaries

- Ant : Pubic symphysis
- Post : coccyx
- Laterally: Ischio-pubic rami & Ischial tuberosities.

Components:- line joining two Ischial tuberosities divided perineal diamond into two triangles

- Urogenital triangle-- Upper triangle is urogenital triangle
- Anal triangle-- Lower triangle is anal triangle

Q: what is urogenital diaphragm?

A: Musculofascial diaphragm that fills the gap of pubic arch.

Urogenital diaphragm has two membranes one towards prostate and other towards perineum (inferior) the inferior fascial membrane is called perineal membrane.

Q: what is superficial perineal pouch?

A: it is a closed space bound between (skin + colle's fascia) & perineal memb(deep).

- Posteriorly colle's fascia & perineal memb fuse
- Laterally bound by pubic rami & ischial tuberosities



Anteriorly it communicates to superficial (scarp) fascia of ant abd wall.

Q: what are the contents of superficial perineal pouch?

A:

- Bulb of urethra
- Crura (root of the penis)
- Bulbo spongiosus
- Ischio Cavernous muscles.

Q: what is deep perineal pouch?

A: Deep Perineal pouch is the space that lies between the superior memb (towards prostate) & the deep memb (perineal memb) of urogenital diaphragm

For all practical purposed deep perineal pouch is same as urogenital diaphragm.

Q: what are the contents of deep perineal pouch?

A:

- Membranous urethra
- Sphincter urethra
- Bulbourethral glands
- Deep Transverse perinei muscles
- Internal pudendal Art & vein
- Dorsal nerve of penis/ clitoris.

Q: what is dorsal nerve of penis?

A: As the pudendal nerve exits from the alcock's canal, it divides into three branches

- Superficial perineal N. -- Supply scrotum
- Deep perineal N. → supplies sphincter
- Dorsal N. of penis → supply glans

Dorsal N of penis accompanies the internal pudendal artery and ascends along the rami of ischium. It then runs forward (&climbs up) along the margin of inferior pubic rami b/w the layers of urogenital diaphragm.

It pierces the inferior memb of urogenital diaphragm (perineal memb) and then runs b/w layers of suspensory ligament and lands on (reaches) dorsum of penis.

- It runs deep to buck's fascia; over albuginea to terminate in glans.
- There are two dorsal Genital nerves –right and left. Each run on the side of deep dorsal veins.

Q: what happens when dorsal N of penis is injured?

A: loss of sensation from glans & skin of penile shaft

Q: what is the female analogue of dorsal genital nerve of penis?

A: Clitoral nerve

- The course of clitoral nerve is identical to dorsal nerve of penis
- Clitoral nerve is injured in TVT/TOT operation, espl. During “Outside-in” technique.

Q: Where is the root of penis fixed?

A: Superficial perineal pouch (pubic rami B/L)

Q: What are the layers of Tunica Albuginea?

A:

- On corpora cavernosa-two layer – outer longitudinal, - inner circular
- On corpora. Spongiosum-single layer.

Q: What are the glands of urethra?

A: Littre's Glands

Q: what are the ligaments of penis?

A:

- Fundiform ligament (fibrous fascia connecting Rectus sheath & Buck's)
- Suspensory ligament (fibrous sheath b/w pubic symphysis & Bucks)

Q: what are the qualities of penile shaft skin?

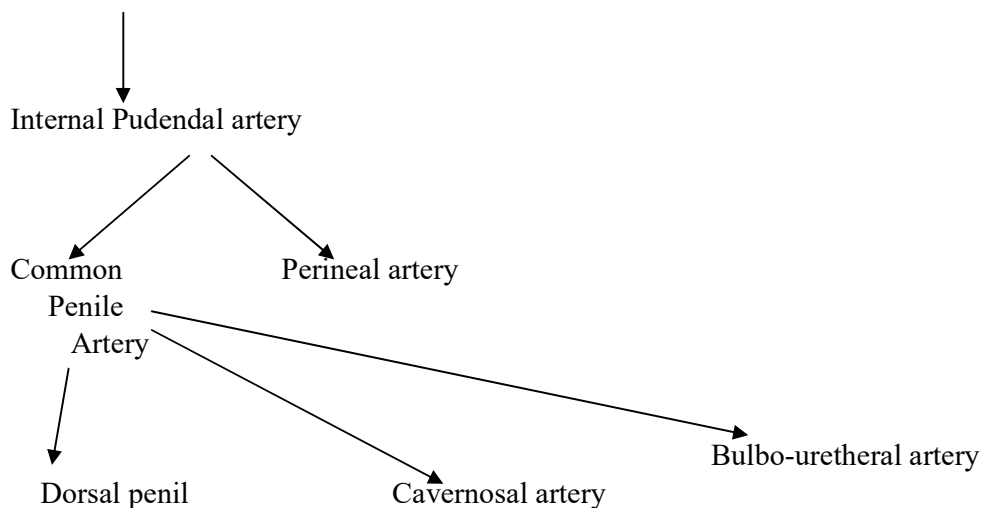
A:

- Extensible
- Freely mobile
- Devoid of hairs
- Devoid of fat
- Folds back over glans as fore-skin
- Supplied by ext. Pudendal artery (B/O femoral Art)

Q: what is the blood supply of penis?

A: Common penile artery B/O Internal Pudendal Artery

Internal Iliac Artery



Q: what are the branches of common penile Art?

A:

1. Dorsal penile art:

-Passes between two Crura of penis & pubic bone and reach the dorsal surface of penis

-Artery runs between vein & nerve

-Vein @ 12' o clock

-Artery @ 11 & 1' o clock

-Nerve @ 10 & 2' o clock

} all lie below the bucks fascia

-It is the alternate blood supply to the urethra (all most safe division in Sx for strictures)

2. Bulbar Urethra Artery

- Supplies – Bulb of urethra

-Urethra

-Spongiosum & Glans



-Main / Principal supply to Urethra

3. Cavernosal artery
- Enters the erectile tissue

Q: How the venous drainage of penis?

A: all the small veins join to form a dorsal vein of penis, which drains into pre-prostatic plexus.
Small venules run obliquely between layers of albuginea, compression of these sub-tunical venules → erection.

Q: what is the nerve supply of penis?

A:
- Sensory: dorsal nerve of penis
- Erectile: Cavernosal nerves
- Para sym: Ach, N.O.

Q: what are the causes of rapid recurrence within 6 months of Sx?

A:
- Penile sarcoma
- Kaposi's sarcoma (usually not A/W L.N)
- Hemangiopericytoma
- Melanoma
- +ve Margin during initial partial penectomy

Q: what is the definition of N₃ disease?

A: B/L fixed nodes;
Or single mobile LN. > 4 cm

Q: What are the chances of Contra-lateral occult mets with ipsilateral palpable nodes?

A: >30%

Ponchetti study → size of penis

Partial Penectomy

Indⁿ: - Invasive tumours involving the glans & coronal sulcus T1

C/ Indⁿ - tumours involving proximal corpora cavernosa (Should be offered total penectomy)

Safe Margin: 2cm of normal tissue proximal to margin of tumour infiltration

Aim: 1. adequate tumor control
2. Ability to stand and micturate

Patient should be able to void in standing position at least 2 cm stream.

Anesthesia: Spinal /GA

Position: Supine

Incision: circumferential incision 2.0cm proximal to lesion.

Procedure:

1. ↓G/A, under antibiotic cover, supine position, a thorough painting and draping done.
2. Tumour covered with sterile glove and stitched
3. A penrose drain is applied as a tourniquet at the base of penis
4. Circumferential incision is made 2.0 cm proximal to the lesion
5. Skin is incised circumferentially
6. Superficial & deep vein are ligated & cut
7. Buck fascia is incised circumferentially
8. Tunica albuginea of the corpora and corpora cavernosa are divided sharply down to urethra (may be sent for frozen section)
9. Urethra is dissected for a distance of 1 cm distal to proximal corpora and then transected (send for frozen section)
10. Corpora are sutured & interrupted horizontal mattress sutures of 2-0 vicryl
11. Tourniquet is removed & hemostasis checked
12. Penile skin is closed in midline using 2-0 chromic
13. Urethra is spatulated dorsally and fixed to the skin with 4-0 vicryl interrupted
14. Deploy Foleys catheter for 2-3 days
15. Dressing applied with Vaseline gauze

Complications:-

- Hematoma, bleeding
- Meatal stenosis
- Psychological trauma of penile loss
- Tumour recurrence 0-8%
- Splaying of Urinary stream
- Loss of Sexual function (80%)

Q: how will you fl/up this patient?

A: Physical Examination of penile stump & inguinal region for nodes –

3 months for 2 years

6 months for 5 years

As per EAU guidelines

@ 2 month for 1-2 yr

@ 3 month for 3rd year

@ 6 month for 4th year

@ 12 month for life

additional I_x like USG inguinal region CXR / CECT pelvis as needed
SOS

TOTAL PENECTOMY

Indication: - Larger Extensive, infiltrating ca penis (T₂, T₃, T₄), local excision is inadequate.

Position: - Lithotomy (extended lithotomy)



Anesthesia: GA / SA

Procedure:

1. ↓G/A, painting & drapping done
2. Tumour covered with glove.
3. Elliptical incision around base of penis
4. 12' o clock dissection upto pubic symphysis. All vessels are ligated & cut. Deep dorsal vein, & arteries ligated & cut.
5. suspensory ligament & fundiform ligament of penis cut
6. Penis is reflected cranially upto abdomen. Dissection begins at 6' o clock urethra looped & separated & cut
7. Corpora cavernosa dissected upto ischioepubic rami, sutured, ligated with 2-0 vicryl and then cut
8. Specimen delivered out.
9. Urethra is tagged with 3-0 chromic for identification. Urethra dissected upto urogenital diaphragm
10. A 2 cm incision is made in perineum and a tunnel created under subcutaneous. Urethra brought down to perineum through tunnel. Save bulbourethral artery to supply bulbous urethra. Corporal branch of Bulbo-urethral Art is sacrificed.
11. Urethra is brought out of perineal incision.
12. Urethra spatulated dorsally and perineal urethrostomy done by fixing full thickness urethra to skin.
13. Foleys deployed (to be removed after 5 ds)
14. Original scrotal incision is closed transversely to lift up the scrotum away from urinary stream
15. Compression dressing done, scrotal support for 24 – 48 hours

Complication:

- Meatal stenosis
- Hematoma
- Psychological trauma
- Splaying of urine stream

SENTINEL L.N. BIOPSY

Indication: Clinically node negative disease with invasive sq. cell ca on penectomy / partial penectomy specimen (T₂)

Position: Supine

Anesthesia: S/A, G/A

Incision: 5cm Incision; parallel to inguinal crease and centered two finger breadth lateral & inferior to pubic tubercle

Procedure:

1. 15 – 30 min before surgery 2ml of methylene blue is injected into the lesion and around the lesion
2. Patient can be anesthetized before the injⁿ / or after the methylene blue injection
3. 5cm incision is made B/L (on both sides) two finger breadth lateral & inferior to pubic tubercle
4. Skin & camper fascia are incised
5. Scarpa fascia incised and superficial inguinal triangle dissected.
6. Upper flap raised and the sentinel blue node is searched for, dissected & removed.
7. Usually supra-medial group of "Dressler" L.N. is also removed (if sentinel LN is not a part of it)
8. A small drain kept & closure done

Q: Who described sentinel L.N. dissection?

A: Cabanas

Q: What are the principles behind sentinel L.N dissection?

A: Ca-penis has a very predicted and organized spread. Thus sentinel LN should be involved before the tumor involves any other region

If sentinel L.N is negative; it is highly unlikely to get tumor spread anywhere else.

Q: what is the success/ failure rate?

A: 80-90% success, 10-20% false negative

Q: What can be done to decrease the false negative?

A: Pre op USG, Dynamic Lympho scintigraphy – Described by Hornblase & Kroon

Q: What is dynamic lymphoscintigraphy?

A: A day prior to surgery: ⁹⁹Tc labeled nanocolloid is injected at 3-4 sites around the primary tumor. (total dose 50m Bq)

Nuclear scans are taken and location of the sentinel lymphnode is marked on skin (including the depth from skin)

10 min before surgery methylene blue is injected

Sentinel L.N. is then harvested using

- Dissection of blue lymphatics
- Intra op use of gamma camera
- Previously marked node site

Q: How will you send these nodes?

A: dissected nodes are sent in formalin

Q: when will you do local tumor excision?

A: after completion of sentinel L.N biopsy; the partial penectomy / local excision / total penectomy is performed

Q: How will you define vascular endothelium invasion on biopsy?

A: Tumour cells within endothelium lined spaces.

Q: How will you send the FNAC samples of L.N.?

A: FNAC samples (USG guided/palpable) can be

- Directly fixed on slide with alcohol & air dried.
 - Hank's (Buffered balanced salt soln.) solution can be used.
- Hanks solution contains Na^+ , K^+ , Cl^- , HCO_3^- , Ca^{++} in optimal quantities.

RADICAL ILIO INGUINAL L.N. DISSECTION

Indn:

Ca penis + Palpable L.N. +ve
+ FNAC +ve LN;

Timing: 4-6 weeks after surgical Rx of primary tumours

Anesthesia: S/A, G/A

Boundaries of dissection (It is not Incision).

- Superior: draw a curved line joining ASIS & Pubic Tubercle
- Medially: Drop vertical line 15cm from pubic tubercle
- Laterally: Drop vertical line 20cm from ASIS
- Inferiorly: Join the Medical & Lateral lower ends

Incision: 3 cm below & Parallel to inguinal ligament extending from lateral to medial border.

Procedure:

1. Deploy foleys , mark boundaries and make the incision
2. Raise the flaps – upper flap upto 4 cm above the inguinal ligament. Inferior flap upto the limit of the dissection
3. Fat and areolar tissue is dissected from the ‘external obl. Aponeurosis & spermatic cord’ to the inguinal ligament.
4. Long saphenous vein is identified and divided. Great saphenous vein may be spared also.
5. Dissection is deepened through fascia lata at Sartorius muscle laterally and adductor longer medially (TFL can also be opened in midline from fossa ovalis to apex of femoral triangle)
6. Apex of the femoral triangle is reached
7. Femoral Art & vein dissected by opening their compartments.
8. Dissection now starts from apex of the femoral triangle and the Lymph-vascular tissues are raised upwards, along with deep inguinal L.N lying on both the sides of femoral vein, until continuity with pelvic dissection is attained at the femoral canal.
9. The lateral aspect of femoral Art is usually not exposed, thus avoiding injury to femoral nerve & profunda femoris artery.
10. The L.N. mass is then delivered out.

Closure:

- Secure hemostasis
- Copious wash
- Sartorius roll → The sartorius muscle is mobilized from its origin @ ASIS and transported 180° to cover femoral vessels muscle is then sutured to Ing ligament and adjacent muscles.
- Deploy a drain & fix
- Closure of the flaps done
- If needed scrotal skin rotational flaps (skinner) an abdominal wall advancement flaps (taba-tabei) or rectus muscle flap may be taken .
- Skin flaps should be tucked to underlying muscles
-

PART II – PELVIC DISSECTION

Incision → for unilateral dissection: Gibson's

For Bilateral dissection: midline vertical

Nodes removed: common iliac, ext. iliac, Obturator nodes

Keep drain & close layer wise

Post Operative:

2-3 days Bed rest & comprehensive stockings

5th day drain removal

Low dose cephalosporin x2 months

Complications:

- Lymphocele
- wound infⁿ
- necrosis
- Lymphedema of lower limbs
- flap necrosis

Q: What are the various incisions for ilio inguinal dissection?

A: for unilateral- Lazy 'S'; Gibson's

For bilateral- vertical midline infra umbilical

Q: What are the Boundaries of femoral triangle?

A:

- Superior : Inguinal Ligament
- Medial : Adductor Longus
- Lateral : Sartorius
- Floor : Pectineus & Adduction Longus – medially
Ilio-psoas muscle – laterally.
- Roof : Fascia lata

Q: What is the clinical significance of femoral triangle?

A: all Angioplasties

Arteriographies

Vascular Stenting

} Done through femoral triangle

MODIFIED INGUINAL LYMPHADENECTOMY

Indⁿ.

1. High Risk patient with clinically Non Palpable L.N.

T₁ G₃, T₂, T₃, T₄, LVI+, high grade histology

2. The Contralateral (normal/non palpable L.N.) side in case of Unilateral Palpable LN

Anesthesia: S/A, G/A; Deploy Foleys catheter.

Position: Frog legged position.



Key aspects of the procedure:

1. Shorter skin incision
2. Exclude the area lateral to femoral artery. Exclude the area caudal to fossa ovalis.
3. Preservation of saphenous vein
4. Eliminating the need of transposing sartorius muscle.
5. Thick skin flaps, including skin → camper fascia → fascia scarpa.
6. Deploying a small negative Sⁿ Drain.

Procedure

Incision: 10 cm long incision, starting from the pubic tubercle, 2 cm below inguinal crease

Procedure:

1. Make the incision in frog leg position
2. Make thick skin flaps including scarpa
3. Raise the upper flap for a distance of 8cm superiorly & 6 cm inferiorly.
4. Superior limit is upto ext. oblique aponeurosis
5. The Fibrofatty tissue just inferior to ext obl. Aponeurosis (& spermatic cord) is dissected & mobilized inferiorly.
 - The Upper flap is retracted using deaver retractor
 - The fibrofatty tissue is pressed with “sponge on a stick” to provide counter traction
 - With the help of right angle artery forceps the fat lymphatics are separated from spermatic cord & base of penis medially.
 - All lymphatics should be properly tied to prevent seroma / collection.
6. Dissection is then commenced in inferior (caudal), direction with the removal of all superficial L.N.
7. Medial Border- Adductor longus muscle, Lateral Border – Sartorius Muscle, is identified next, to define the boundaries.
8. The Muscles are traced up to their confluence. (at the apex of femoral triangle)
9. The saphenous vein is identified & preserved. The (Branches/tributaries) of the saphenous vein may be sacrificed.
10. Tensor fascia lata is incised at the medial border and reflected laterally (Tensor fascia lata can be opened at the level of fossa ovalis and then opened in midline to the apex of femoral.) no need to close this fascia lata at the time of closure.
11. Femoral sheath is incised over femoral artery laying open the arterial compartment. Femoral sheath is incised over femoral vein laying open the venous compartment. This femoral sheath is stripped upto apex.
12. The deep L.N. are then removed from their location between artery & femoral vein. Superficial, perforating branches of artery & vein are tied & cut.
13. Specimen is delivered enblock & sent for frozen.

Closure:

- Wound is irrigated liberally
- Drain kept & fixed
- Closure done
- Compressive dressing applied
- Long term antibiotic cover.

Q: Who described this modified Ing Dissection?

A: Catalona

Q: What all group of L.N. are dissected?

A: Superficial→ all Dressler's '5' group,

Deep→ deep ing L.N. medial to Femoral artery

Q: what is the false negative rate of this Catalona operation?

A: 5%

Q: What will you do if frozen section comes +ve?

A: Convert & complete the Procedure as Radical Ilioinguinal lymphadenectomy.

Q: What are the contents of femoral triangle?

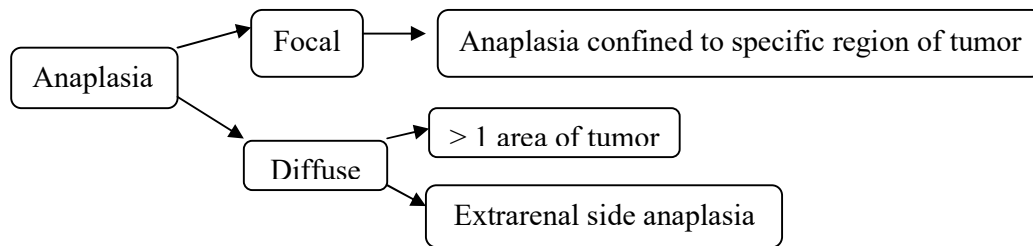
A: from Lateral to Medial--Nerve, Artery, Vein, and L.N.

❖ **Nephrogenic Rest:**

Abnormal persistence of embryonic cells into perinatal life that can produce malignancy.

❖ **Pathology of Wilm's Tumor**

- Classical Wilm's Tumor:
 - Undifferentiated Blastema
 - Epithelial Differentiation
 - Stromal Component
 Proportion of each competent is variable
- Anaplasia:
 - Rare in patient with < 2 years
 - Resistance to chemotherapy



- Pathology after Chemotherapy:
 - Stomal and epithelial competent seen more often. They have poor response to chemo but have good response to surgery.
 - Post chemo predominant blastema – High relapse rate.
- Post chemotherapy stratification: SIOP
 - Low Risk: Complete necrosis
 - Intermediate Risk: Rest all
 - High Risk: Blastema predominant
Diffuse anaplasia

❖ **Tumor Invading IVC:**

- In Child:
 - Wilm's Tumor
 - Adrenal Carcinoma
 - Lymphoma
 - RCC
 - Neuroblastoma
- In Adult:
 - Wilm's Tumor
 - Adrenal Carcinoma
 - TCC Upper Tract



- Neuroblastoma
- Lymphoma
- Retroperitoneal Tumors

❖ **Ask About:**

- Visual Impairment
 - Mental Retardation
 - Fainting Episodes
 - Speech Abnormality
 - Convulsion
- } History in child with abnormal mass

❖ **Wilm's tumor:**

- **95% of renal tumors < 5 years are Wilm's Tumor**
- **10% Wilm's Tumor are associated with syndrome**
- **5-10% are bilateral**
- **1-2% Familial Wilm's Tumor**

❖ **Ideal Type (I) Wilm's Tumor:**

- Stomal Predominant
- Favorable Histology
- Interlobular NR
- Early age
- Associated with genitourinary abnormality

❖ **Ideal Type (II) Wilm's Tumor:**

- Blastema or Epithelial type
- Late onset
- Hypertrophy or Organomegaly
- Perilobar NR

❖ **Wilm's Tumor X: WT_x**

- Targeted by Somatic mutation
- Targets single X in male
- Active X in female
- WT_x leads WT₁ mutation

❖ **Rarity of abnormal pain in Wilm's Tumor:**

- Due to tumor rupture into peritoneal cavity
- Bleeding within tumor

❖ **Why Wilm's Tumor are prone to rupture?**

- Soft and friable with necrosis and ham'g area. This increase risk of rupture

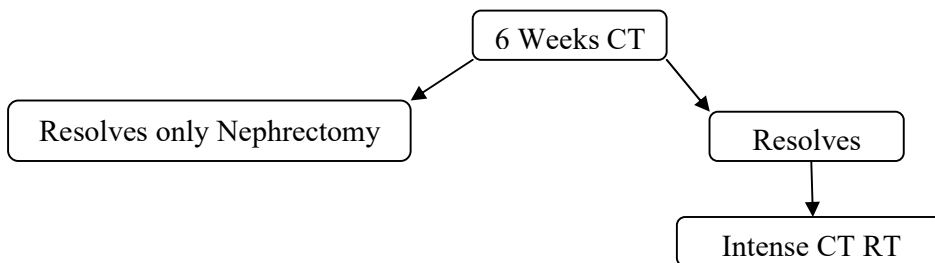
❖ **Difference between interlobar and perilobar NR:**

<u>Interlobar NR</u>	<u>Perilobar LR</u>
- Anywhere in lobe	- Lobar periphery
- Early in onset	- Late onset
- Stoma rich	- Blastema elements
- WT ₁	- WT ₂



❖ Management of Wilm's Tumor:

- **Very Low Risk:**
 - Stage I Fh
 - Weight < 550gm < 2 years
 - Nothing to do
- **Wilm's Tumor with stage I/II Fh with: LOH 1P | 16q:**
 - VCR + Adriamycin + Doxyrobutin for 18 weeks
- **Stage III/IV without LOH 1 P | 16q:**
 - Same CT for 24 weeks +RT to flank
- **Pulmonary Mets:**



- **I/II Focal Anaplasia and I diffuse anaplasia:**
 - CT for 24 weeks + RT abdominal
- **II to IV diffuse, IV Focal:**
 - Never Chemotherapy
 - Investigational Agents
- **Repapse of Wilm's Tumor:**

Standard Risk	Nonanaplastic Relapse with only vincristine	Do surgery if possible
High Risk	Nonanaplastic Relapse with full chemotherapy	Exopiside Ifosfomide HDCT with stem cells
Very High Risk	Anaplastic blastema type	Investigational treatment Oxiliplatin VEGF inhibitors

❖ Post Wilm's Tumor surgery chemotherapy can be started by post op day-3.

- Radiation by post op day-9
- RT dose: 10.8grey.

❖ Chemotherapy dose:

- Acrinomycin: 1.3mg/ml
- Vincristine: 1.5mg/ml
- Doxorubicin: 30-45mg/ml



❖ **SIOP protocol for Wilm's Tumor:**

- Pre operative Adriamycine + Vincristine
- Localized tumor : 4 weeks
- Mets: 6 weeks to chemotherapeutic agents + Epirubbin
- Then surgery
- Post surgery do give CT + RT

❖ **Ascitis in Wilm's Tumor suggestive of:**

- May be due to tumor rupture
- Secondary to metastasis
- IVC involvement

❖ **Bilateral Wilm's Tumor:**

- Do CT scan if feature suggestive of wilm's tumor – no need to do biopsy
- Initial 6 weeks of chemotherapy
- Tumor response assessed at 6 weeks
- If reduction and amenable to partial nephrectomy: Do PN
 - Do surgery first on less tumor burden side then high burden side
- If no reduction:
 - Do open as o.w. high fallacies of percutaneous biopsy.
 - Bilateral as bilateral discordant histology can be present
 - After biopsy give 2 additional CT for 2 weeks
 - Surgery must not delayed by 12 weeks of initial management
- If bilateral PN is not feasible then do bilateral nephrectomy as chemotherapy with modification can be given in anaplastic patient.
 - Renal transplant can be done after 2 years of tumor irradiation
 - Follow up upto 4 weeks

❖ **Positive margins post Wilm's Tumor:**

- FH: Taken care with chemotherapy
- Anaplasia: Poor outcome with positive margins

❖ **Follow up with Wilm's Tumor:**

- USG to rule out C/L wilm's tumor 6 monthly upto 5 years. If syndromic patient then upto 7 years, along with that do
 - Urine Routine & Micro
 - S. Creatinine
 - HT

❖ **Staging of Wilm's Tumor: NWTS:**

- Stage-I:
 - Confined to kidney
 - Completely removed
 - Intact capsule
 - No rupture
 - No sinus involvement
- Stage-II:
 - Extracapsular penetration
 - Completely removed
 - Renal sinus involvement
 - Renal vein involvement

- Stage-III:
 - Peritoneal Spillage
 - Positive margins gross or microscopic
 - LN involvement
 - Peritoneal implant
- Stage-IV:
 - Distant metastasis
- Stage-V:
 - Bilateral tumor

❖ **Indication of biopsy in wilm's tumor NWTs protocol:**

- Inoperable tumor
- Bilateral tumor
- Planning to NSS
 - Selected cases of normal C/L kidney but having syndrome association as having high chance of C/L kidney involvement
 - IVC thrombus above hepatic vein

No role of formal lymphadeyectomy:

No role to explore opposite kidney for possibility of wilm's tumor.

Case 1

A 2.5 yr old female child is brought to the hospital by parents with complaints of abdominal swelling since 15 days

ODP

Pt was relatively asymptomatic below 15 days when the mother incidentally noticed the Rt sided abd, swelling of a cricket ball size during bathing the child. The swelling is of same size since that day, neither increased nor decreased in size, not related to any relieving or aggressive factors

Child is eating well, playful

No H/O trauma, No H/O hematuria

No H/O any bowel / bladder disturbances/ N/V/D

No H/O fever / recent illness

No H/O visual impartment / Genitourinary abnormal @ birth/ mental retardation

No H/O speech impairment / limb abnormal growth fainting episodes

Past medical H/O
Past Sx H/O } NAD

Past immunization history; upto date

Birth H/O: cesarean delivery @ 34 weeks 2.0 kg birth wt
Immediate cry, Nil-otherwise

Family H/O - NAD -father, mother, sibling H/O →NAD



On examination

Child is well playful, oriented moderately built, moderately nourished

T- Normal,

p- 102/min

BP- 104/ 60

Eyed normal, Tongue normal

All limbs – normal

Spinal examination → normal

No limb edema,

RS /CVS- clear

Abd examination

Abd examination

On examination inspection

- Abdomen is flat, skin is normal
- Umbilicus is centrally located, inverted
- Mild fullness seen in Rt upper Quadrant

On palpation

T- Normal, no tenderness

A firm slightly mobile 10-12 cm mass is felt in Rt upper qdt

Ballottement

Fluctuation

Transillumination

} negative

On knee elbow position-mass doesnot fall away (retroperitoneal)

Q: what all it could be?

A:

- Right Renal mass – Wilms tumours
- Retroperitoneal mass
 - neuroblastoma
 - Rhabdomyosarcoma
- Right polycystic kidney
- Right gross HN
- Multiloculated renal cyst
- RCC

Q: how will you investigate the child?

A:

- Basic blood & urine Ix
- X-ray → CXR, KUB
- USG abd (in case of hard renal lump direct CT scan be done)

Q: what is the other name of Wilms tumour?

A: Nephroblastoma



Q: from which cells & when it starts developing?

- Develops in intrauterine life
- From primitive Metanephric Blastoma

Q: what is the Basic etiology of Wilm's tumour?

A: WT₁ gene on 11p13

- Beta catenin pathway
- Intralobular Nephrogenic Rests
- Associated with
WAGR
Denys Drash syndrome
Frasier syndrome

WT₂, gene – 11p15

- IGF-2 & loss of imprint pathway
↓
EFG
↓
Beckwith Wiedemann syndrome

Q: what are the common congenital abnormalities associated with Wilm's?

A:

- Cryptorchidism (part of WAGR)
- Double renal collecting system
- Horse shoe kidney
- Hypospadias (part of WAGR) (SWOHWB)

Q: what are the common syndromes a/w Wilm's tumour?

A:

1. **WAGR** (WT₁ gene on 11p13)
 - Wilms tumour (50%)
 - Aniridia
 - G.U abnormal
 - Retardation mental
2. **Denys Drash syndrome (DDS) WT1**
 - Wilm's tumour
 - Gonadal Dysgenesis (pseudo-hermaphrodite)
 - Nephropathy (mesangial sclerosis) Later ESRD
3. **FRASIER syndrome**
 - Wilm's tumour (rare 5%)
 - Gonadoblastoma (50%)
 - Gonadal dysgenesis (male pseudo hermaphrodite, genetic XY, Phenotype-female)
 - Nephropathy (focal segmental glomerulosclerosis)

Appear late in comparison to DDS

4. Beckwith Weidman syndrome (BWS), WT₂ gene – 11p15

- WT₂ – Wilm's tumour (5%)
- Hemi hypertrophy
- Macroglossia
- Macrosomia (↑birth wt & ↑ length, nephromegally, Hepatomegaly)
- Umbilical defects
- Neonatal Hypoglycemia

Q: What is the importance of WT₁- gene?

A: encodes Zinc finger Transcription factors

WT1 required for- ureteric bud formation

- nephrogenesis
- gonadal formation

Q: what is Imp of WT₂?

A:- WT₂ → (produces)IGF-2→(controls)Epidermal growth factor EGF

Uncontrolled EGF leads to Macrosomia

↑ Metabolic demand by tissues lead to neonatal hypoglycemia

Q: what important chromosomal abnormality will you look for?

A: LOH (loss of Heterozygosity) on 1p & 16q

(Poor prognostic factors)

Q: what are the presentations of a patient of Wilm's tumour?

A:

- Abd mass
- Abd pain
- Hematuria
- Fever, UTI
- HTN
- Metastatic symptoms
 - Lung – cough, Respiratory distress
 - IVC compression – limb edema, ascitis, varicocele, HTN, CHF

Q: what will you specially ask for in the history of a patient of Wilm's tumour?

A: I will ask for history of

Visual disturbance

Speech disturbance

Mental growth

} WAGR

Speech disturbance-Macroglossia

Hypertrophied organs

Urine protein DDS

H/O fits

} BWS

Birth H/O

Immunization H/O

Family H/O



Q: what % of Wilms patients will have HTN?

A: 2%

Q: What is the cause of HTN in Wilms?

A:

1. Bioactive substances from tumour (para-neoplastic syndrome)
 2. Compression of renal vessel (RVH) / segmental artery
- HTN should resolve after Nephrectomy

Q: what are the indications for emergency operation in a patient of Wilm's tumour?

A: active bleedings

Tumour ruptures

Q: What will you see for in lab Ix in a patient of Wilm's tumour?

A: Hb, serum creatinine, Sr Ca^{++} , coagulation profile, platelet count

Q: why coagulation profile?

A: factors VIII deficiency

Von willibrand disease (in 10%)

Q: what radiological investigations will you like to do in a child with suspected renal HARD mass ?

A: ideally there is no need for x-ray or USG and straight forward CECT can be done

CT abdomen with contrast

- Mass size,
- Organ of origin
- Contralateral kidney
- IVC involvement/thrombus
- enhancement of mass
- L.N status
- liver mets

CXR-PA/ CT-Chest → chest mets

Q: what will you do next?

A: As there is no family H/O ,

No syndromic association

Normal contralateral kidney

I will counsel the parents for Rad Nephrectomy

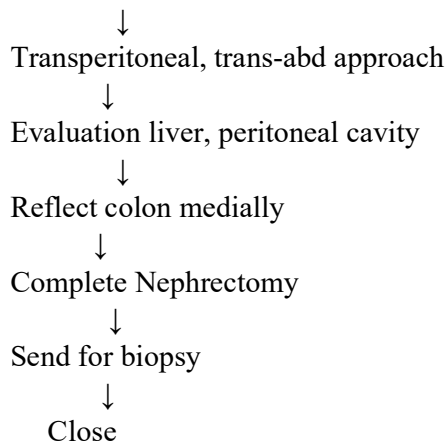
Q: will you do Biopsy of the lesion?

A: No

- Because chances of Tumour seedling / rupture/ hemorrhage/ stage change
- More over false –ve rates of biopsy are high
- Management plan does not alter

Q: what incision will you choose for Wilms tumour nephrectomy?

A: Transverse incision, 2 finger breadth above the umbilicus, from mid axillary line (on the side of tumour) to 1 cm beyond midline



Q: what are the Indications for pre OP chemo Rx?

A:

- Bilateral tumour
- Solitary kidney
- Planning NSSx(nephron sparing surgery)
- IVC involvement above hepatic veins
- Unresectable tumour
- Tumour in horse shoe kidney

Q: what are the most imp prognostic factors?

A:

1. Histology / anaplasia/ degree of undifferentiation
2. LOH of chr 1p & 16q

Other factors

Tumour size, mets, LVI

Cytogenetic factors (poor)

- ↑ Telomerase activity
- DNA index > 1.5
- LOH 1p 16q

Q: How will you do risk stratification in Wilms?

A: **Shamberger criteria (for local recurrence)**

- **Histology – favorable, - unfavorable**
- **Tumour spill**
- **Residual tumour**
- **Lymph node involvement**

Q: what management protocol do you follow?

A: NWTSG → surgery first then chemo

Q: what is the difference between NWTs and SIOP treatments in Wilms tumour?

A:

- NWTs which follows the upfront surgery principle in all stages of the disease.
- The SIOP which follows the upfront chemotherapy principle in all stages of the disease.
- The NWTSG has always recommended upfront nephrectomy to define the accurate stage of the tumor and the histology, on which further treatment stratification is decided.
- In contrast, the SIOP investigators pioneered the concept of pre-nephrectomy chemotherapy in all patients over 6 months of age to reduce the tumor size and prevent intraoperative spillage due to tumor rupture and increased the proportion of children with a lower tumor stage that required less overall treatment

Q: what is NWTs?

A:

- **Three co-operative groups, the children's cancer study group (CCSG), the cancer and leukemia group B (CALGB), and the southwest Oncology Group (SWOG) combined to form an intergroup known as National Wilms Tumor Study (NWTs) in 1969 as there was a need to collaborate in gathering a statistically significant number of patients.**
- The NWTs, a cancer research co-operative group, was created with the purpose of improving survival of children with Wilms' tumor.
- Many pediatric oncology centers (over 250) in the United States, Canada and other countries joined this study group

Q: what is COG?

A:

- **In 2001, NWTs merged with several other pediatric oncology cooperative groups to create the Children's Oncology Group (COG).**
- However, the NWTs is still active in name today completing follow-up of the late effects of treatment for patients previously enrolled in its trials

Q: what are the trials conducted by NWTSG?

A: Purpose of study

- NWTs 1 – To determine the effect of surgical technique on the results of the treatment.
- NWTs 2 – To study the prognosis of patients with Wilms' tumor.
- NWTs 3 – To reduce the treatment for low-risk patients and find better chemotherapy for those at high risk for relapse.
- NWTs 4 – To evaluate the efficacy, toxicity and cost of administration of different regimens for the treatment of Wilms' tumor.
- NWTs 5 – To identify the biologic prognostic factors.

Q: what is SIOP?

A:

- SIOP (Societe Internationale D'oncologie Pediatrique) is another European Group that in 1971 started studies on Wilms' tumor.
- It differed from NWTs in the concept of giving preoperative chemotherapy to all patients.
- The promoters of SIOP with a view of reducing the risk of tumor rupture during upfront surgery, as was seen during NWTs studies, planned upfront therapy – initially radiotherapy and later chemotherapy to shrink the tumor

Q: what are the SIOP trials?**A: SIOP 1**

Pre-operative radiotherapy significantly prevents tumor rupture and induces favorable stage distribution. Additional actinomycin-D (6x) does not improve DFS/AS in either arm.

SIOP 2

The benefits of pre-operative radiotherapy as in SIOP 1 trial were confirmed.

Post-operative chemotherapy for 6 months as good as 15 months. Hence, children should receive chemotherapy only for 6 months following nephrectomy.

SIOP 5

Pre-operative 2 drug chemotherapy is as effective as pre-operative radiotherapy in avoiding ruptures and improving the stage distribution.

SIOP 6

Stage I – Treatment with Vincristine and Dactinomycin was as effective for 17 weeks as for 38 weeks in terms of event-free and overall survival rates.

Stage II – Patients with negative lymph nodes who were assigned to receive no radiation therapy had a higher recurrence rate.

SIOP 9

Stages I, II, III – 8 weeks pre-operative treatment does not produce a favorable stage distribution compared to 4 weeks.

Q: what is the SIOP histological classification?

A: SIOP histologic classification is as follows:

- a. Low risk (completely necrotic nephroblastoma or cystic partially differentiated nephroblastoma),
- b. Intermediate risk (regressive, epithelial, stromal, mixed, or focal anaplastic nephroblastoma), and
- c. High risk (blastemal or diffuse anaplastic nephroblastoma).

Q: what are the advantages and disadvantages of NWTSG?

A: NWTSG investigators recommend immediate nephrectomy because pre-nephrectomy chemotherapy administration is associated with several risks, including the following:

1. administration of chemotherapy to a patient with a benign disease as in SIOP trials, pre-chemotherapy confirmation of diagnosis is not mandatory;
2. administration of chemotherapy to a patient with a different histological type of malignant tumor;
3. modification of tumor histology; and
4. Loss of staging information.

Disadvantages

- Tumor spillage intra-operatively, which increases the risk of local abdominal relapse and subsequent poor outcome
- Failure to sample lymph nodes leads to downstaging and under-treatment of the patient

Q: what are the advantages and disadvantages of SIOP?

A:

- It reduces the tumor size considerably, thereby making surgery simpler and reducing the chances of tumor rupture intra-operatively; this reduces the likelihood of local and distant recurrence
- Possible role of renal sparing surgery in the affected kidney could be evaluated with the tumor size reduced pre-operatively

Disadvantages

- Pre-nephrectomy chemotherapy is considered to cause alterations in tumor histology and to downstage the tumor
- Chances are there that the tumour in question may not be a Wilms tumour at all , the child then gets a chemotherapy unnecessarily.

Q: what are the factors of local recurrence?

A: Shamberger criteria

- **tumour spillage**
- **Unfavorable histology**
- **Incomplete removal**
- **LVI+**
- **LN+**

Q: what are chemo related complications in childhood?

A:

- GIT abnormalities
- Pancytopenia, anaemia
- Bone marrow depression
- CHF

Q: what are complications of XBRT in childhood?

A:

- Scoliosis
- Short height
- Hypogonadism
- Testicular / ovarian failure
- Pregnancy related (miscarriage)
- Secondary malignancies
- GIT, GUT toxicities

Q: what are the syndromes associated?

WAGR	WT, Aniridia, G.U abnormalities, retardation mental
DDS	Denys Drash syndrome- WT, pseudo-hermaphrodite, nephropathy ,
Frasier's	WT, Pseudo-hermaphrodite, FSGS (nephropathy)
BWS	Beckwith–Wiedemann syndrome– Macroglossia gigantism umbilical hernia, hypoglycemia

Q: what is sex ratio incidence?

A: M/ F = 1:1

Q: what is the most common site of mets?

A: lungs

Q: After whom is Wilms tumour named as?

A: 'Max Wilms' German surgeon

Q: What are the etiological types?

A:

- sporadic -90%
- Familial -2%
- Syndrome- 8%

Q: what is the histological pattern in Wilms tumour?

A: Tri phasic

- Epithelial
- Blastemal
- Stromal

Q: what are CPDN, CN, and CWT?

A: CN

Cystic Nephroma
(Benign)



Observation



CPDM

cystic partially differentiated
Nephroblastoma



Rad Nx is complete cure



CWT

cystic Wilms tumour



Rad Nx + chemo

Q: Will you do lymphnode dissection with nephrectomy?

A:

- No, RPLND not required
- Only enlarged LN removed
- Sampling may be done for staging purposes

Q: Is Biopsy Indicated?

A: - NO

- According to NSGCT protocol, in stage -V Bilateral disease, Biopsy can be performed.

Q: what will you do for large / unresectable Wilms tumour?

A: chemo first (Neo-adj) x 6 cycles

Q: When will you do surgery after neo adjuvant chemotherapy?

A: after completion of initial course of chemotherapy, usually at 8-10 wks

Q: what are the chemo agents?

A:

- Vincristine = Oncovin



Adriamycin = doxorubicin

- Dactinomycin = actinomycin

Q: what will you do or pt < 6 month age?

A: Surgery 1st

Fl/by Vincristine + Adriamycin (If needed)

Reduce dose of Dactinomycin to 1/3 (If needed)

Q: What protocol is followed in India?

A: NWTSG

Q: What is prognosis?

A: >80%, 5yr survival after multimodality Rx

Q: Suppose the HP-examination report of Nephrectomy comes as clear cell sarcoma?

A:

- Sarcoma arises from mesenchymal cells
- Mesenchymal tumour with cells depicting clear cytoplasm
- Highly aggressive tumour
- Requires post op radiotherapy (even on stage 1)
- Blood / Hematogenous metastasis common
- Bone / Brain mets are common
- Do bone scan MRI brain
- Give post op doxorubicin , Vincristine, Cyclophosphamide, VADCE

Q: What If the biopsy comes as Rhabdoid tumour of kidney (RTK)?

A:

- Variant of sarcoma → arising from muscle cells Rhabdomyosarcoma
- Very aggressive / very lethal – sarcoma
- 2%
- Early presentation / advanced stage
- RTK mets to Brain → Do CT/MRI Brain
- Chemo Resistance
- Give IMRT to brain & XBRT to tumour bed

Q: what If the biopsy comes as congenital mesoblastic nephroma (CMN)?

A: CMN is the most common tumour

- Mean age of presentation 3.5 months
- Histological type- classic, -cellular- mixed
- Rad Nx Is enough (complete removal)
- No need of post op chemo / radio

Q: What is CPDN?

A:

- Cystic Partially differentiated Nephroblastoma
- Occurs within 2 yrs of life
- Contains Blastemal cells / Nephrogenic rests
- Rad Nx is complete cure
- Post op chemo If nodes are involved

Q: What if Biopsy is Angio myolipoma?

A: Usually diagnosed at CECT

- Rare in childhood
- Associated with T.S.C (tuberculosis sclerosis complex)
- Often bilateral, multiple, evolving lesions
- Renal lesions in TSC are – simple cyst
 - AML
 - Polycystic kidney disease
 - RCC
- Tendency to bleed
- Mx – angio embolization, - partial Nx
- Cut off size for surgery is 4 cm

Q: What can be the D/Ds for suspected Wilms Tumours?

A:

1. Wilm's
2. Neuroblastoma
3. RCC
4. Clear cell sarcoma
5. Cystic nephroma (Benign)
6. Partially differentiated cystic willing
7. Multi loculated cyst (benign)
8. AML (Benign)
9. MCDK (Benin)

Q: what is the role of FDG-PET in the diagnosis and staging of Wilms tumour?

A: no role

- ❖ **TCC is 5th most common carcinoma**
 - 90-95% are bladder TCC
 - 5-10% are upper tract TCC.
- ❖ 60% of upper tract TCC are invasive on diagnosis
- ❖ **Risk factors:**
 - Balken Nephropathy
 - Smoking
 - Analgesic Abuse
 - Occupational – Amyline dye worker
 - Arsenic
 - Aristolochic fungi
- ❖ **Hereditary Upper Tract TCC:**
 - Suspect in age <60 years
 - Personal history of HNPCC
 - 1st degree relative of HNPCC with < 50 years
 - Two 1st degree relatives of HNPCC
- ❖ **Involvement of bladder by upper tract TCC:**
 1. Field change disease
 2. Monoclonal down-seedling theory
- ❖ CT scan has high sensitivity for upper tract detection.
Flat lesions are not detectable unless they exert mass effect.
- ❖ MRI indicated for patient who can't undergo for CTU due to raises S. Creatinine.
- ❖ **Cytology:**
Routine diagnostic work-up
Cytology less sensitive for UT TCC than bladder carcinoma.
Urine cytology should be done before dye study.
If cytology positive with normal cystoscopy, urethra and prostate then it is highly Suggestive of UT TCC.
- ❖ **Diagnostic URS:**
Useful when diagnostic uncertainty and kidney sparing treatment is considered
OR
Patient with solitary kidney
URS and biopsy considered only if it can change the management.
 - As small instrument channel
 - Show depth of biopsy specimen
 - Precise staging is difficult



❖ **85%** of pelvic tumor → Papillary

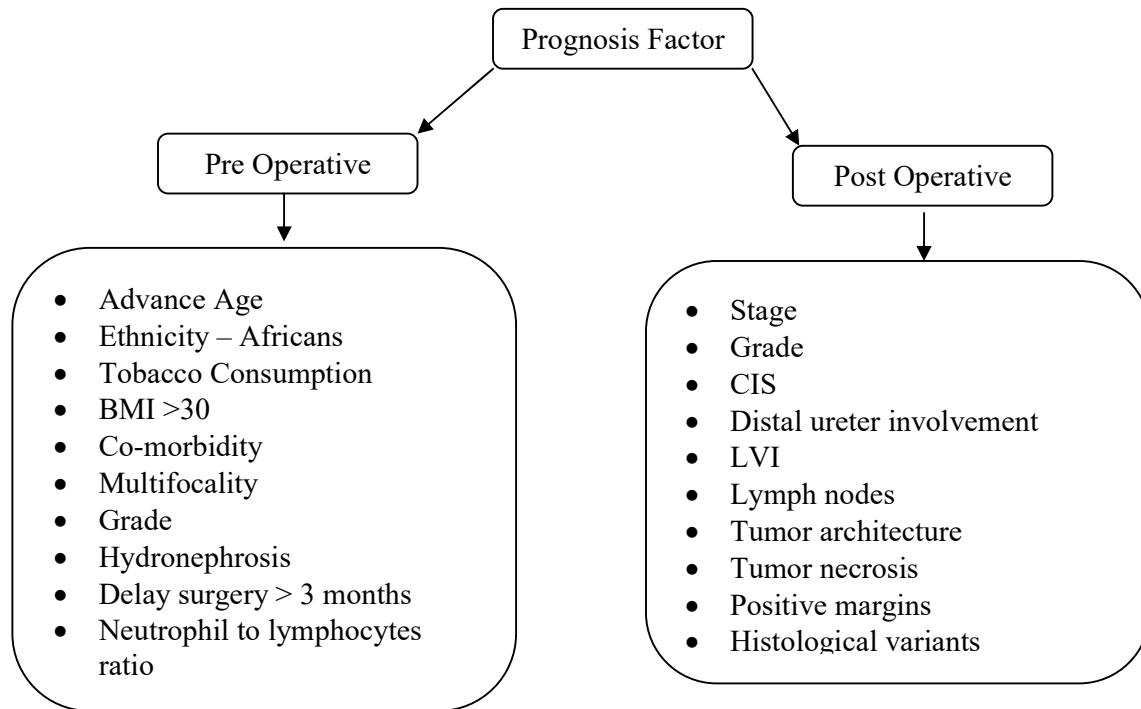
15% are sessile

Among them **50%** are invasive from papillary

80% are invasive from sessile

Recurrent after conservative treatment: Proximal → distal direction - 33-55%

Recurrence of lesion proximal to original tumor is very rare.



❖ **Predictors for increase risk of bladder carcinoma**

1. Patient specific:

- Male
- Previous bladder carcinoma
- Pre op kidney disease

2. Tumor specific:

- Positive margins
- Urethral location
- Multifocality
- Necrosis

3. Treatment specific factors:

- Positive margins
- Extravesical cuff removal

❖ **UT TCC: Risk Stratification**

- Low Risk:

- Unifocal disease
- Tumor < 2cm
- Low grade cytology
- Low grade biopsy
- No HUN

} All must be present



- **High Risk:**
 - Hydronephrosis
 - Multifocality
 - Tumor > 2cm
 - High grade
 - Positive cytology
 - Previous cystectomy for bladder ca
- } Any of above

❖ **Lymph Nodes:**

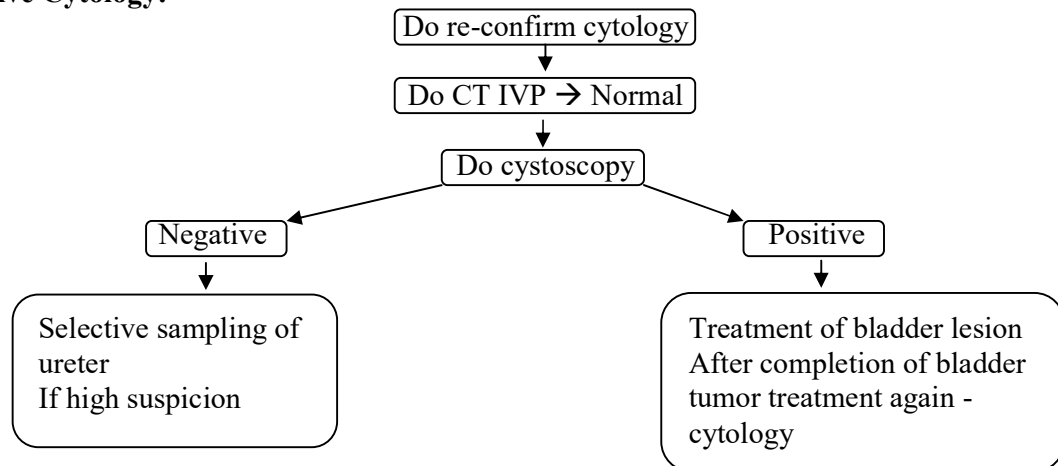
- **Pelvic Tumor:**
 - Hilar, Retrocaval, Interaortocaval upto IMA
- **Upper 2/3 ureter:**
 - Same group as pelvic tumor LN but upto aortic bifurcation
- **Lower 1/3 ureter:**
 - Pelvic group of LN

- ❖ Kondo suggested that there is a survival advantage of LN dissection from PT2 disease.
No role of LND from T1 lesion.
Roscigno suggested that there is no role of number of LN to remove rather than it should be template based LND.

❖ **In Invasive Disease: Template based LND**

- Improves staging
- Improves prognosis
- Improves survival

❖ **Positive Cytology:**



❖ **CIS of UT is the diagnosis of exclusion**

- No role of radical nephroureterectomy
- No role of segmental ureterectomy
- Do follow up or BCG instillations

- ❖ UT TCC patient have hematuria with clots, clot colic, but palpable lump is very unusual.

- ❖ 2-4% of patient with Ca bladder can developed UT TCC.
While 15-75% of patient with UT TCC can develop bladder CA



❖ **CIS**
Multifocality
Positive Margins
Involvement urethra } **High chances of UT TCC after Ca bladder**

❖ **Panurotelium Lesion:**
TCC involving bladder+ two extravasical sites
In Male: Urethra + Ureter
 Female: Both the ureters

❖ Relative thinness of muscle layers leads to invasion of easy event in UT TCC Gc to bladder ca.

❖ **Findings in CTU which are suggestive of UT TCC:**

- **Filling defect**
- **Obstruction**
- **Incomplete filling of part of PCS**
- **Non visualization of upper tract**
- **Enhancing mass lesion HU average 40-45**

D/D

- Stone
- Blood clot
- Fungal ball
- Papilla sloughing

❖ CTU Sensitivity: 100%
 Specificity: 60%

❖ **Why bladder cuff is removed in UT TCC surgery?**

- **High risk of recurrence at VUJ area**
- **Surveillance is always difficult post surgery**
- **Endoscopic surveillance almost impossible**

❖ No oncological benefit of removal of specimen intact.

❖ **Invasive intramural TCC:**

Ideal management will be RNU with partial cystectomy with pelvic LN dissection with post surgery mytomycin with instillation.

❖ **Probability of LN involvement:**

T1 lesion: 2%
T2 lesion: >16%

❖ 5 years survival for T2/T3 tumor: <50%
 T4 tumor: <10%

❖ **Follow up protocols:**

Why follow up needed?

- **Multifocality of TCC**
- **high chances of bladder Ca**
- **Metastatic potential**

General Follow up:

- 3 monthly cytology + cystoscopy for 1year
- 6 monthly for 2-3 years
- Then annually



Imagine of kidney:

- 6 monthly CT scan
- Nephron saving surgery - 6 monthly check URS for 2 years

Metastatic:

- 6 monthly X-Ray & LFT for 2 years

So after surgery follow up:

- 3 months
 - History
 - Urine R&M
 - Cytology
 - LFT
 - X-Ray
 - Cystoscopy
- 6 months
 - CT Scan + Same
- 9 months
 - Same as 3rd month
- 12 months
 - Same as 6 months

Then same at 18 & 24 months

❖ **Kidney sparing management:**

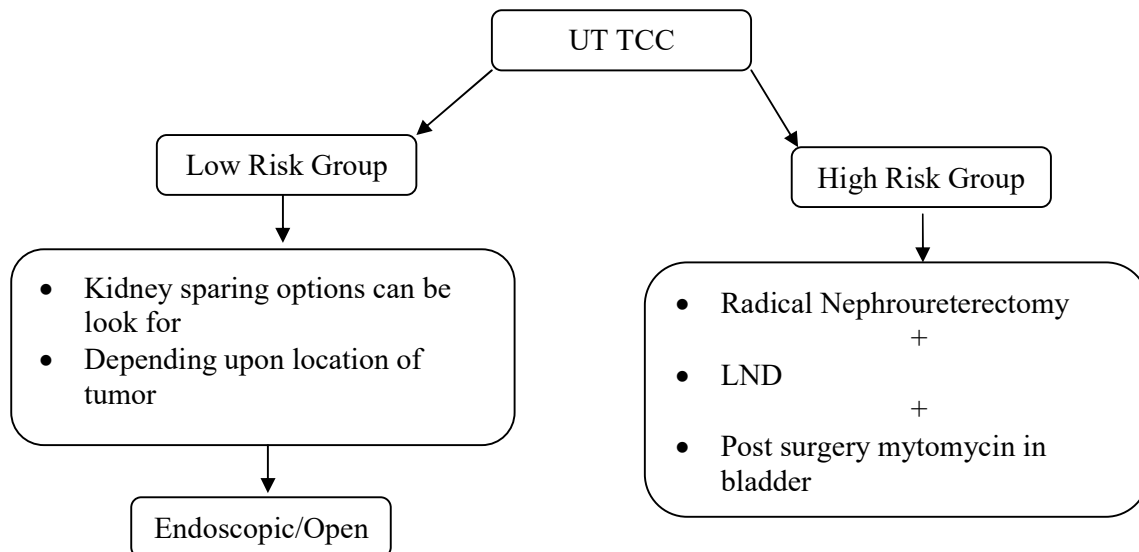
If case of unifocal tumor

<2cm

Low grade

Low cytology

Willing for close follow up



Lower Ureter:	Endoscopic / URS
	Distal ureterectomy
U/U or M/U:	Endoscopic
	Uretero ureterostomy
Calyx:	Flexy URS
	Percutaneousl surgery



❖ **Endoscopic management of UT TCC:**

1. Retrograde endoscopic management of TCC:

- By flexi – Rigid URS

Adv:

- Low morbidity
- Maintaining close system – less seedling

D.Adv:

- Smaller instruments
- Less working channels
- Difficult for pelvic / L/C tumor

❖ **Methods:**

- Bulk excision with base ablation
- Tumor resection upto base
- Biopsy of tumor and ablation with laser

2. Antegrade Methods:

From PC system

With Nephroscope

Adv:

- L/C easily assessable
- Larger working space
- Can stage the procedure
- Complex system treatment can be done

D.Adv:

- More morbidity
- High chances of tissue seedling
- Higher complication rate

Methods:

After establishment of 30fr. tract

- Complete resection of tumor with separate base biopsy
- Bulk removal with base biopsy and fulguration
- Comp. resection → keep nephrostomy after 14 day re look biopsy
- If no lesion fulguration of base

❖ **Open approach:**

For lower ureter: distal segmentectomy ureterectomy with re-implant + LND

Refluxing anastomosis → so that post surgery surveillance will be easy

But theoretical high risk of tumor seedling.

Segmentectomy ureterectomy can be done with 2cm margins - High risk of recurrence.

❖ **No role of partial nephrectomy for UT TCC**

It is always better to do radical nephroureterectomy for the patient with SFK and to put life long HD

Morbidity of HD is more but not more than Re UT TCC & morbidity

❖ **High grade tumors:**

Treatment plan:

- Open / Laparoscopic nephroureterectomy with excision of bladder cuff with template based LN dissection + Post surgery intravesical MMC instillation

Incision:

- Vertical midline
- Flank with Pfannenstiel / Gibson

❖ Management options for ureter in laparoscopic:

1. Conventional method
2. Laparoscopic approach
3. Transvesical ligation & detachment method
Not ideal for L/U mass
4. Transurethral resection of Ureteric orifice
5. Intraurethral resection of Orifice

❖ **Adjuvant RT:**

May be for T3/T4

To prevent local Recurrence

But no definitive proven role

EAU-2018 doesn't recommend post surgery RT in UT TCC

❖ **Chemotherapy:**

Lack of control trials

Can be given as adjuvant / neo adjuvant

Ideal if given then give as neoadjuvant

Cisplatin based CT may have some role

No role of RNU in metastatic UT TCC except for palliative considerations.

CHAPTER

13

Ca Bladder

- ❖ Points to be ask for history of haematuria?
 - Duration of haematuria
 - Pain / Painless
 - Total / Initial / end haematuria
 - With clots / without clots
 - Types of clots
 - Amorphous
 - Serpiginous
 - Intermittent / continuous
 - How many episodes
 - Does it resolved on its own?
 - How is urine after haematuria
 - Blood transfusion needed or not?
 - Previous history of haematuria
 - Anticoagulant
 - History of bleeding tendency (bleed from other side of body)
- ❖ Gross Haematuria: Symptom
Micro Haematuria: Sign
> 3 RBC / HPF of centrifugated urine sample
- ❖ D/D of haematuria with clots in 60 years male:
 - Ca bladder
 - RCC
 - Upper tract TCC
 - BPH
 - Stone with BPH
 - Ca prostate
- ❖ D/D of mass palpable ant to rectal wall?
 - U.B. mass
 - Prostate Ca
 - Large vesicle calculus
 - Pelvic kidney with mass
 - S.V. cyst / mass
- ❖ Variant of (TCC) urothelial Ca of bladder:
 - **Nested Variant:**
 - Confused with von braun's nest
 - Worst prognosis
 - 70% died within 3 years



- **Clear cell variant:**
 - Doesn't s/o poor prognosis
- **Micro Papillary:**
 - High progression from NMIBC → MIBC
 - 80% chances of LV invasion
 - Neo adjuvant chemo treatment worsens survival
 - Upfront RC is the definitive treatment.
- **Small Cell variant:**
- **Plasma cytoid:**
 - Very poor prognosis
 - Often invading perivesicle fat

Non TCC Tumor:

1. Small cell tumor: Chemotherapy or RC + multimodality
2. Carcino sarcoma: Multimodality treatment
3. Melanoma: RC
4. Primary Lymphoma: RT
5. Pheochromocytoma / Paraganglioma

❖ **Smoking increase risk of bladder TCC:**

- By CYP450 induction
- TP53 mutation
- Carcinogen in smoke
- Cadmium and nitrosamine

No risk of passive smoking.

❖ 20% of TCC are due to occupational hazard.

Latency period: 10-20 years

Dye, Rubber, Painting, leather, industries are more affected.

❖ **Urachal Carcinoma:**

- Adeno carcinoma
- Young age

Diagnostic criteria:

- Located on dome or anterior wall
- Sharp demarcation between tumor and normal surface
- Lack of CIS
- No cystitis, glandular in surrounding mucosa
- Bulk of tumor in wall
- No adenocarcinoma anywhere in body.
- Enteric type histology

Staging: **SHELDON STAGING**

1. Confined to mucosa
2. Confined to Urachus
3. Regional LN
 - 3a – bladder
 - 3b – peritoneum
 - 3c – abdominal wall
 - 3d – other viscera

4. Non regional LN + distant spread

Treatment:

- Partial cystectomy + Urachus + umbilicus removal
- No role of CT / RT

❖ **Polychronotropism:**

- Tandancy of tumor to recur at same site or other side.
- Mostly for bladder

❖ **Von Braun's Nest:**

- Islet of benign appearing urothelium situated in lamina propria.

❖ **Cystitic Cystica:**

- Is von braun's nest in which urothelium in the centre of nest undergoes for esophilic liquification.

❖ **Cystitic Glandularis:**

- Von Braun's nest in which cells have undergone for glanular metaplasia.
- May be precursor for advance of bladder
- Associated with pelvic lipomatosis

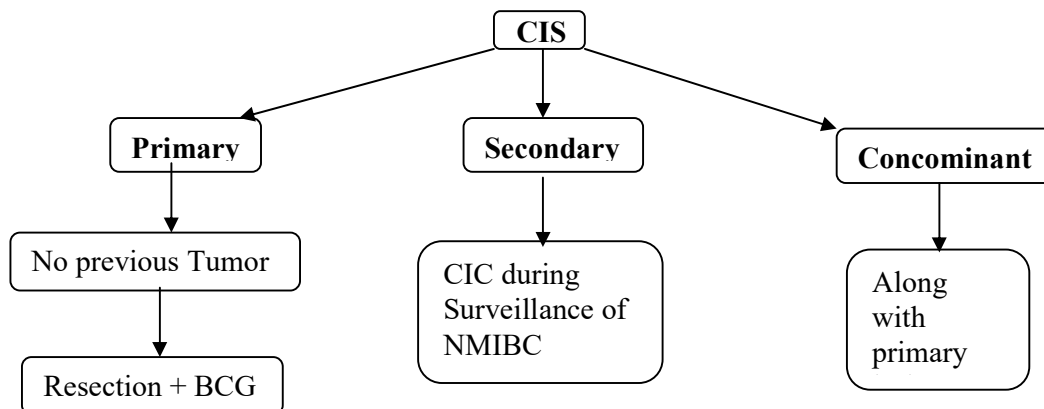
❖ **NMIBC:**

- **25% PNLUMP**
- **50% low grade**
- **25% high grade**

❖ **PUNLMP:** Pappilary urothelial neoplasia of low malignant potential.

- Papillary growth with minimal cytological atypia
- > 7 cell thick
- Solitary and on triagone
- Thin papillary stalk
- Non invasive

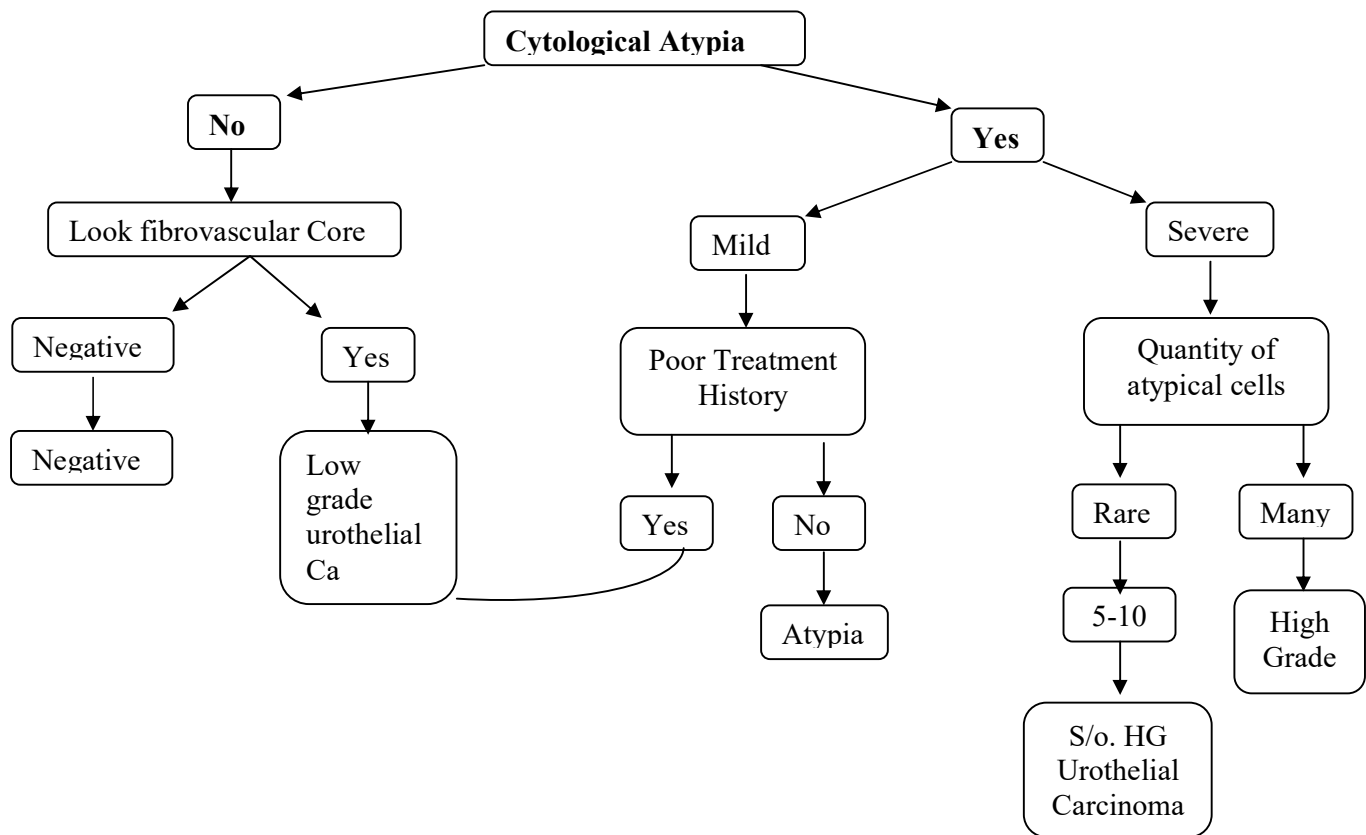
❖ **CIS: Non papillary, non invasive high grade lesion confined to urothelium.**
Coined by MELICOW



❖ **Cytology:**

Paris System of Cytology Reporting

- 1) Non satisfactory
- 2) Negative for HG urothelial carcinoma
- 3) Atypical cells
- 4) Suspicious for urothelial Ca
- 5) LG carcinoma
- 6) HG Carcinoma



Cytology:

Pathologist interpretation of the pathological features of exfoliated urothelial cancer cells voided or washed sample:

Indication

1. **Evaluation of patient with haematuria**
2. **Surveillance of urethral after surgery**
3. **Surveillance of high grade urothelial Ca**
4. **Monitoring progress, recurrence and response to treatment**

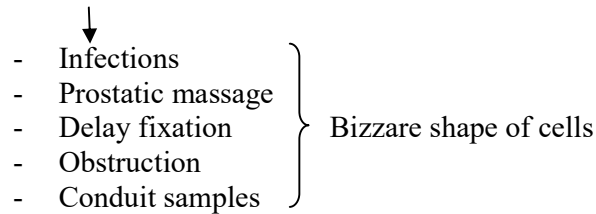
If one sample positive then no need to do three samples for cytology

- ❖ **Patient who has visible mass on USG in bladder – No need to do pre – resection cytology (Debatable, but we have to tell in exam that we will do cytology as patient having history of haematuria)**



❖ D. Adv. of Cytology:

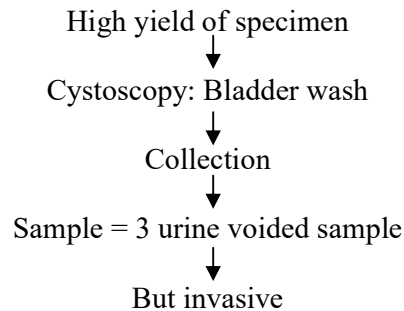
- a. No localization of disease
- b. Interpretation depends upon observer
- c. Not suitable for surveillance
- d. Can't used for non urothelial tumors
- e. False positive



❖ Urine has high acidity and low obmolarity. Non – optimal for exfoliated cells to survive
Potential for bacterial contamination

- Add 1gm vitamin C
- Proper hydration
- Improved specimen collection

❖ Barbotage Specimen:



Urovysion Fish

- Florescent in situ hybridization
- Detect increase copy number or ancuploidy.
- 3, 7, 17 and 9 chromosome.

Positive:

- i. 5 or more cells with 2 or more chromosome gain**
- ii. 12 or more cells with single chromosomal gain**
- iii. > 12 cells with 9p21 loss**

False (+):

- Seminal versicle cells
- Not positive in infection, haematura.

False (-):

- Death cells

Anticipatory FISH:

- Cytology and cystoscopy negative but fish is positive.
- 35-50% patient may developed TCC within 2 years



Adv. of fish:

- In BCG treated bladder - Cystoscopy + cytology is difficult but Fish positive suggestive of recurrence.
- In equivocal cases
- Eliminates needs for scopy

❖ Immunocytes:

- Florescent labeled antibody to 3 glycoprotein present in urothelial
- Texas Red
- Green
- Atleast 500 cells to check for resuit.

❖ BTA Stat:	Qualitative	}	Detect comp to related protein
BTA Tract:	Quantitative		

TUR-BT

Ideal (planning) answer to say in exam is: Bimanual examination + cystourethroscopy + TUR-BT

70 degree scope or flexy scope for complete visualization of bladder and resection with 30° scope as loop is well visualized with it.

❖ Bladder is filled only enough to visualized its content:

As overdistension leads to:

- Tinning of bladder
- Increase chances of perforation

❖ **Resection must be:**

- **Piecemeal**
- **Delay resection of any stalk until most tumor has been resected**
- **To maintain counter traction**
- **Avoid fulguration – difficult in HPE reporting**

❖ **TUR-BT in ant. Wall tumor:**

- Difficult to ressect
- Partial minimal bladder filling with compression from anterior abdominal wall.
- Long lengh resectoscope
- Some times perineal urethrostomy if scope can not reach upto tumor.

❖ **TUR BT near ureteric orifice:**

- Pure cutting current
- No coagulation o.w. scarring
- Laser TUR-BT

❖ **Resection of intramural ureter:**

- theoretical risk of dissemination of tumor
- Post operative period do USG on follow up
- To look for asymptomatic HUN



❖ **TURBT of diverticular tumor:**

- Tumors having absent detrusor backing
- For low grade looking tumor: Resection + fulguration of base
- High grade looking tumor: Resection upto perivesicle fat.

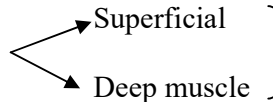
❖ **Tumor completely fills bladder:**

- Insert hemostatin balloon under controlled epidural anesthesia 10cm above diastolic BP
- Keep for 6 hours
- Irrigating catheter for 2-3 weeks → leads to sloughing of tumor
- Then do TUR-BT

❖ **Tumor at Dome:**

- Bowel can lie outside dome
- Current may pass and damage bowel
- Furthest from trigone, so always do TUR-BT in minimal full bladder.
- Dome at old age have thinnest wall to perforate.

❖ **How do you confirm that deep muscle are there or not in biopsy?**

- Criss cross muscle fibres at bladder must be seen
- Ideally  } Biopsy should be sent separately

❖ **How to D/D between trigonal tumor from median lobe?**

Median lobe: continuation with prostate

- Homogenous
- Hyperechoic mucosal lining
- Association with voiding LUB

- ❖ Anterior wall tumor }
Tumor at dome } Diff. to visualization with USG

❖ **Bimanual Examination:**

- No role now with CT scan era
- Still old examiners like to mention it
- No extra gain in bimanual examination then CT
- No loss of doing it too

Bimanual Pulpation both pre & post TUR-BT

With empty bladder without foley

MARSHAL STAGING:

- T2a: No palpable tumor
- T2b: Palpable nodule not 3 dimensional
Post TUR-Bt not palpable
- T3a: palpable mobile 3 dimensional structure
Not disappears with TUR-BT
- T4a: No mobile involving to surrounding organs
- T4b: Involving lat. Pelvic wall

Over diagnosed: 11%

Under diagnosed: 31%



❖ **Bipolar TURBT:**

- Decrease risk of TUR syndrome.
- Theoretically suggested that bipolar decrease the cautery artifact but practically not
- Slow cutting movement can cause more charring
- Swift controlled movement for tissue cutting under artifact on HPE

❖ **Laser TURBT:**

- ND Yag Laser
- End fire, non contact fibers with 5-15 degree of divergent which allows minimal penetration.
- Most feared complication: Forward scattering which leads to hollow viscus perforation
- To limit this power should not increase beyond **35W**, which limit temperature upto **60°C** on other bladder wall.

Advantages:

- Minimal bleeding
- Can be done in patient with anticoagulation
- Minimal dysuria
- Minimal time for PUC

Disadvantages:

- Costly
- No tissue for HPE
- Forward scattering

**Fulguration done upto while coagulation visible on bladder wall.
(Denaturation)**

- **Ideally for low grade tumors**
- Or**
- **For follow up tumors**

❖ **Never do stenting in Ca bladder case:**

- Difficult to sent
- Reflux of urine can seed tumor cells

❖ **Indication for prostatic urethral biopsy:**

- Bladder neck tumor
- Normal cystoscopy with positive cytology
- Abnormal looking prostatic urethra

❖ **Multiple broad base tumor or tumor difficult to approach – only biopsy to taken rather then complete resect the tumor.**

OBTURATOR BLOCK & JERK

In TURBT tumor located posterolateral wall – direct stimulation of obturator nerve during resection leads to sudden jerky adductor muscle spasm.

Leads to:

- Perforation
- Vessel laceration
- Obturator haematoma

Obturator block doesn't abolish the reflux but can suppress it.

❖ Obturator Nerve:

- Mixed nerve
- Motor function to adductor muscle
- Sensory to post. portion of knee
- From L2, L3, L4 – courses under CIA and anterolateral to ureter
- Passed through obturator canal divides into two branches

❖ Indication for obturator block:

- **Lateral wall bladder tumor**
- **Hip joint pain**
- **Adductor muscle spasm**

❖ C/I:

- Local infection inguinal lymph node enlargement
- Pre-existing neuropathy

❖ Methods: Nerve stimulator

- Started with 2mA to 0.5mA before injection of L/A
- Needle position: At point 2-3 cm vertical until hit inf. Border of superior rami
- Withdrawal and reinsert 2-3 cm slipped on anterior wall
- Finally redirect upto cephalic direction
- L/A: Mepivacain 1-2% or Lignocaine 1-2%
- Effect seen after 10-15 minutes

Other methods:

- **USG guided**
- **Blind Labat's method**

❖ Complication of TURBT:

- Bleeding:
 - Proper haemostasis is must
 - Bleeding will not stop with traction
- Perforation:
 - To prevent it
 - Minimal distension of bladder
 - Avoid obturator jerk
 - Bulky tumor – stage the procedure
 - Incomp. Resection
 - Obtrutor jerk
 - TUR syndrome
 - Perforation

❖ Theoretical risk of tumor seedling but it doesn't change the stage of disease. Only extra vigilant surveillance needed. Proper wash must be given. Post operative MMC can't be given.

❖ Traditionally said TURP and TURBT can't be done at same time. But low grade looking tumor then TURBT and TURP can done simultaneously.

But high grade and solid tumor TURBT & TURP don't do at same sitting due to theoretical risk of tumor seedling.

- Re-stage TURBT:

- Any patient with high grade
- Any patient with T1 tumor
- But timing not consists upon: ideally to be done after 2-6 weeks

- **Re-TURBT indication:**
 - No muscle in biopsy
 - Anatomical inaccessible site
 - Medically unstable patient
 - Large tumor volume
 - High chances for perforation
- **Re-stage TURBT done for completely resected tumor but to proper staging while re-TURBT proper staging while re-TURBT for incompletely removed tumor to complete TURBT.**
- **Soloway based on observation that initial tumors are on floor and lateral wall but recurrence on dome finding laid the hypothesis of tumor cell seedling.**

Tumor cell seedling at places of minor traumatic occurs during cystoscopy.

MMC effective to reduce this tumors cell seedling and reduced recurrence rate by 12%

Level 1 evidence s/o peri op MMC instillation immediately reduced recurrence in solitary low grade tumor of < 3cm size.

MMC & epiribucin have same effect

No effect seen with thiotepa.

MMC doesn't have any effect on disease progression

- ❖ **60% risk of under staging if no muscle in biopsy**
- 30% risk of under staging if muscle seen in biopsy**

- **C/I for MMC:**
 - **Extensive resection**
 - **Perforation**
 - **Incomp. Resection**
 - **Uncontrolled haematuria**

MMC is ideal for solitary < 3cm completely resected tumor without risk of perforation.

- **Cx of MMC:**
 - Local irritative symptoms
 - Chronic cystitis
 - Skin desquamation
 - Decrease bladder capacity
 - Calafied eschar
 - Difficult cystectomy later on
- ❖ **Rule of 1/3 for high grade T1 tumors:**
 - **1/3 patient have no recurrence**
 - **1/3 patient required RC**
 - **1/3 patient died from mets**
 - **1/3 patient on RC can converted into MIBC**
- **Indication for random biopsy:**
 - Negative cystoscopy with positive cytology
 - When bladder preservation is planned
 - Multiple tumors

❖ Never cystoscopy modalities for tumor surveillance

Rationale:

- Cystoscopy with white light can miss 33% of lesion
- Increase surveillance and cost to patient with routine cystoscopy.
- Increase recurrence after routine scopy.

❖ Blue light cystoscopy:

- Based on different concentration of florescent in normal tissue and pathological specimen.
- Absorption of elluminating light of appropriate wave length by molecules.
- Then exited molecules release photon of low energy and high wave lenth.
- 340-440nm to \rightarrow 630-700nm
- Pathology - Red and normal tissue - blue

Agent:

- 5 ALA (Amino Leulinic Acid)
- Hexaamino Leulinic Acid

D.Adv:

- Can't differentiate recurrence from scar, inflammation, hyperplasia.

❖ Narrow Band Imagine: NBI:

- Enhance contrast between tissue without florescent agent
- Filter white light into two narrow band of Blue 415nm, Green 540nm
- Which are absorbed more by hemoglobin
- Vascular structure appears as brown / green against pink urothelium
-

❖ OCT: (Optical Coherance Topography)

- Delineate tissue architecture with back scattering of light, similar to USG mechanism
- High resolution: 10-20 μ m
- Probe: 2.7mm

Adv:

- Post BCG recurrence identify
- For laser TURBT
- Diffentiate between scar & CIS
- Improve staging

❖ Confocal microscopy: Using low power laser with florescent dye

❖ Endocystoscopy

❖ Raman spectroscopy

❖ BCG: (Bacillus Calmette Guerin)

- In 1976 **ALVARO MORALES** 1st use BCG in NMIBC.
- BCG is powderised lyophilised vaccine which must be reconstitute with distil water / saline.
- In India we are using **Danish 1331** strain of BCG having **1-19 x 10⁸ CFU**.

❖ BCG Protocols:

- 6 weekly instillation dose with 3 weekly maintenance dose at 3 months upto 1 yea then 6 monthly for 2 years \rightarrow **Lamm Protocol**
- **Swog Protocol:** 3 monthly maintenance dose at 3 & 6 months then every 6 months at 2 years

PGI Mukhopadhyay Protocol: Maintenance dose every monthly

❖ **Why 6 weeks of instillation course?**

- Initially morales give it for 6 weeks as BCG was supplied in pack of 6 vials.
- Cell mediated immunity takes 3-4 weeks to develop and skin reaction reaches by 5 weeks as similar to bladder response also. So minimum of 6 doses to be given.
- **Bohle** suggested that no maximum response after 6 doses only ADR are increase.
- So it should be given in 6 doses at week interval.

❖ **Why at interval of one week?**

- Adverse event with BCG if happens it will lasted for 1 week, so gap of 1 week was advised.

❖ **Why maintenance dose at 3 months?**

- As cytokines produces in relation to BCG treatment lasted for 3 months so additional boost up doses are required.

❖ **C/I for BCG Therapy:**

Absolute C/I:

Immunocompromised patient
Immediate post TURBT
Traumatic catheterization
Gross haematuria
Past history of BCG sepsis
Total incontinence

Relative C/I:

Acute UTI (Intravasation)
Past history of TB (Not known)
Poor performance status
Advance age
Liver disease

Not known efficiency:

Patient with artificial spincher or prosthesis
Patient with VUR
Patient with anti TNF medicines

❖ **Good Response to BCG:**

- If age < 70 years
- 1st negative scopy
- < 3cm size tumor
- No prior recurrence

❖ **4 weeks after TURBT:**

- It is time for re-epithelisation of urothelial wound which minimised potential for intravasation

❖ **Before BCG do urine routine & micro to rule out infection / haematuria. BCG infusion should delayed until UTI treated**

❖ **Instruction to patient before BCG instillation:**

- Patient may have dysuria, increase frequency after BCG therapy
- Explained possible complications
- Dehydration and avoid coffee
- Patients have to retain urine for 2 hours
- Patients have to change position to bath urothelium. (controversial)
- After two hours voiding and bleach toilet.
- No specific transmission to close contact infection.

❖ **Response of BCG:**

- **CIS:** 50% cases 5 years durable response
30% 10 years durable response
Free of progression or recurrence
FDA approve for treatment of CIS
- **Residual Tumor:** 60% response to residual tumor
- **Prophylaxis:** decrease 30-40% risk of recurrence
- **Progression:** Decrease 30% of tumor progression

20-30% patient will response to 2nd induction course.

Additional courses after 2nd dose increase risk of progression.

- ❖ Post BCG treatment failure delayed upto 6 months as response rate for patient with high grade treatment with BCG may raise from 55 to 80% after 6 months.
Tumoricidal activity may continue upto some week after cessation of therapy.

❖ **Investigation modality to detect failure:**

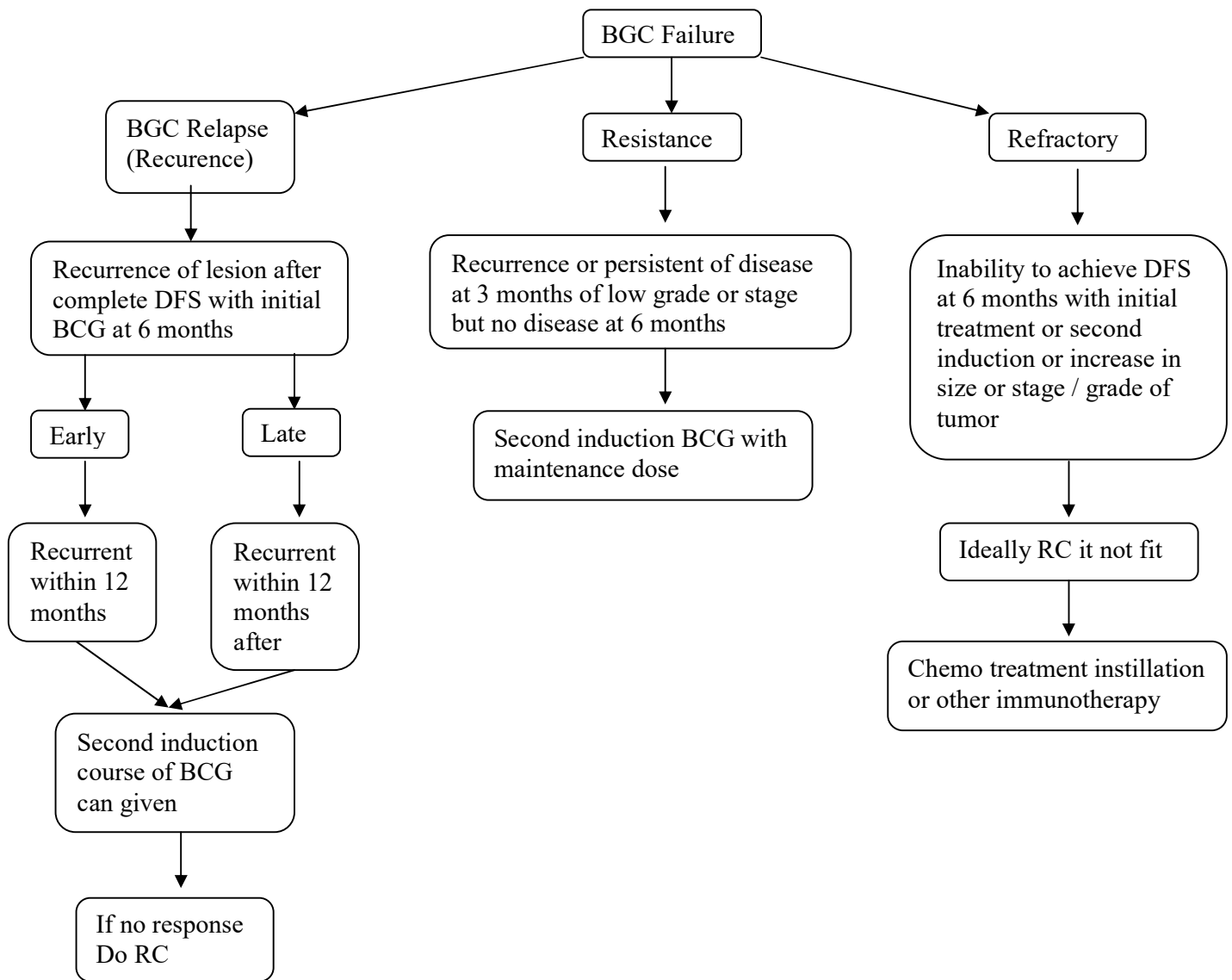
- Cytology
- Cystoscopy
- Urogyson Fish: conversion of positive to negative highly suggestive biopsy to required
- Biopsy strongly needed

❖ **Maintenance dose given upto atleast 1 years:**

For patient with CIS

T1G3 tumor

But only 16% of patient can completing tolerate full dose.



❖ **BCG Intolerance:**

- Patient who can't tolerate BCG full dose
- Given BCG upto 1/3 reduced dose OR Other optional therapy / chemotherapy instillation

Chemotherapy Instillation

❖ **Thootepa:**

- Alkelyting agent 30mg / 30ml solution
- No effect of disease progression
- Only reduce recurrence rate

❖ **Anthracyclin Antibodies:**

Doxorubicin: No role on progression

Valrubicin: Newer topo isomerase II inhibitor semi synthetic

- **FDA approved BCG refractory CIS**
- 800mg weekly for 6 horus



- ❖ Gemcitabine: 2gm in 50ml saline
- ❖ Combination of chemotherapeutic agents

EORTC: European organization for research and treatment of cancer

Low Risk:

- < 3cm size
- Solitary
- T9, No CIS
- Primary

High Risk:

- T1, G3, CIS
- Recurrent multiple large T9G1G2
(All must be present)

Intermediate:

- Not included in low or high risk

❖ **Indication for timely cystectomy:**

- T1G3 deverticulae disease
- T1G3 with LVI
- Recurrent T1G3
- T1G3 with poor bladder capacity
- Endoscopic unresectable tumor
 - Bulky tumor
 - Stricture Urethra
- Patient preference
- Multiple risk factors:
 - Tumor > 3cm
 - Diffuse CIS
 - Multifocal

- ❖ Cystectomy in setting of high grade T1G3 refractory to BCG not known as timely as RC is the indication and treatment option only.

It is timely cystectomy not early.

As done before the traditional indications of RC

❖ **Advantages of timely cystectomy:**

- 40% of NMIBC on TURBT tumors to MIBC on RC.
- 40% of NMIBC can progress to MIBC over period.
- Best chance for staging tumor.
- BCG only delays progression doesn't prevent it.
- Avoid surveillance and repeat scopy.
- 10 years survival after early RC is 80% CIC to T1G3 patient progress to MIBC 50%

❖ **Disadvantages:**

- Cx of RC.
- High mortality of surgery.
- 1/3 of patients are over treated.



Q: what are the causes of hard prostate?

A:

- chr. Prostatitis
- Ca prostate
- Post BCG
- post TURP
- Granulomatous prostate (TB),
- Prostatic infarct / stone.

Q: what is Guaiac Test?

A: DRE → Stools on Glove → send for occult blood → Guaiac strip → Guaiac test.

Q: what is microscopic hematuria?

A: more than 3 RBCs / HPF (40x magnification power) of the centrifuged urine sample

Q: what is gross hematuria?

A: hematuria visible to naked eye.

Q: what is the relevance of timing of hematuria w.r.t urine stream?

A:

Initial hematuria

- very rare
- due to urethral pathology
- due to inflammation

Total hematuria

- most common
- due to bladder/ upper tract pathology
- infection / tumour / stone / UTI

Terminal hematuria → at the end of micturition

- Secondary to inflammation in the area of bladder neck or trigone / prostatic urethra.

Q: what is importance of a/w pain?

A: painless hematuria → malignancy

Painful hematuria → Clot colic → due to upper tract clots.

Q: what is the imp of shape of clots?

A: slender clots or thread like clots are from upper tract

Amorphous clots are usually from bladder

Q: what are the causes of Red urine?

A:

- Hematuria
- Hemoglobinuria
- Myoglobinuria
- Dietary – blackberries, Beetroots (anthracyanins)
- Drugs – Rifampicin, Phenothiazines.

Q: what will be the first test for Hematuria?

A: urine dip stick test.

Q: what is the principle of urine dip stick for hematuria?

A: urine dip stick has a peroxidase reagent substrate (ortho-toluidine) on which hemoglobin acts like peroxidase like activity and thus changing the colour of the substrate.

Q: For how long you have to dip the stick in urine?

A: 3-5 seconds

Q: when will you see for results?

A: after 1 min (60 sec)

Q: what are the chief components which are usually tested on urine dip stick examination?

A:

- blood
- sugar
- protein
- nitrites

Q: what other information will this dipstick gives?

A: see for

1. protein (to rule out glomerular causes)
2. nitrites (to rule out UTI)
3. glucose (general DM)
4. Leucocytes (pus cell / UTI)
5. Specific gravity

Q: what is the general colour of protein change?

A: shades of green.

• HEAMATURIA

Q: what is the D/D interpretation of +ve dipstick for blood?

A: D/D:

1. Hemoglobin urea
2. Myoglobin urea
3. Hematuria

Q: what are the sensitivity / specificity of urine dip stick?

A: sensitivity > 90%

Specificity = 70%.

Q: what are the causes for false –ve dipstick for hematuria?

A: over diluted urine

Ascorbic acid → inhibits peroxidase activity

Q: what is 'the' diagnostic test for ruling in/out hematuria?

A: Urine – Routine microscopy

See for RBCs under microscopic.

Also shape of RBCs will give a clue about pathology.

Q: suppose Urine routine does not show RBCs (in pt of urine dipstick +ve for hematuria) what will you do?

A: Possibilities are

- Myoglobin urea
- Hemoglobin urea
- Over diluted urine (check specific gravity)

Q: how will you differentiate b/w Myoglobinuria v/s Hemoglobinuria?

A:

- centrifuge the specimen and see the supernatant part
- Supernatant pink → hemoglobin urea → because Hb binds to haptoglobin
- Supernatant clear → Myoglobinuria → because Myoglobin is water soluble
- Myoglobin → mixes well → clear supernatant
- Hb → Heterogenous soln → hazy pink supernatant

Q: How can you guess the cause of bleeding on the basis of urine routine microscopy?

A: look for

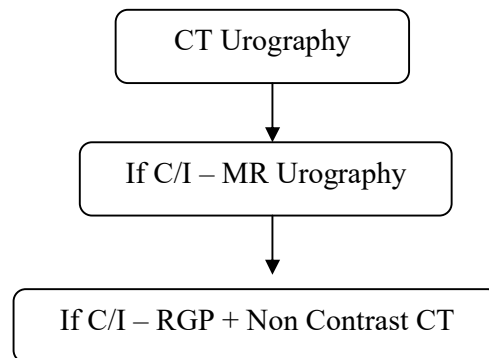
- Shape of RBC
- RBC – casts
- Protein urea

❖ **Microscopic Haematuria (MH) : ≥ 3 RBC / HPE**

- Single urine examination suffice to prompt evaluation of haematuria.
- **6.5% of normal population has microscopic haematuria.**
- **1/3 – 2/3 asymptomatic microscopic hematuria can Have underlying cause.**
- 1.8 – 3.6% has underlying malignancy
- **Positive urine deepstick should be confirmed with microscopy b/o false positive deepstick test is seen in:**
 - Dehydration
 - High specific gravity of urine
 - First morning voided sample
 - Exercise
 - Myoglobinuria
- Normal persons can excrete about 1000 RBC/ml urine. Upper limit can be 5000-8000 RBC/ml.
- **Patient should have antiplatelets should also undergo same evaluation as patient is not taking it.**
- **Event is a medical cause of hematuria is established AUA recommends to do urological evaluation.**

❖ **Risk factors of malignancy in MH:**

- **Male, >35 years, smoking, occupational history**
 - **Analgesic abuse**
 - **Past history of urological disease or intervention**
 - **Past history of gross hematuria**
 - **History of irrelative LUTS**
 - **Past history of pelvic RT**
- **For asymptomatic MH cystoscopy is avoided if patient is < 23 years, without risk factors o.w. cystoscopy is must for asymptomatic MH.**
There is no role of blue light cystoscopy.
- **Imaging:**



- **No role of cystoscopy in asymptomatic MH patients.**
- **If initial evaluation negative, do annual urine analysis for 2 years which if negative you can release patient from followup.**
If recurrent or persistant AMH repeat workup at 3-5 years.

❖ **Symptomatic MH:**

- Cytology must for all age
- Cystoscopy can be an option
- 10% association with malignancy

❖ **Gross Hematuria:**

- 25% risk of malignance

What are the components of Hematuria work up?

- Urine dip stick(mandatory)
- Urine-routine, CBC , RFTs, coagulation profile(mandatory)
- Urine cytology
- USG (mandatory)
- CECT KUB
- Cystoscopy



❖ **Hematuria from BPH:**

- M.C. Cause after 60 years of age
- Causes:
 - **Increase vascularity from increased micro vascular density.**
 - **Increased VEGF activity.**
 - **Action taken in 2 weeks to 9 months.**
 - **90% patient has symptomatic improvement.**

❖ **Persistent or recurrent BPH related hematuria:**

- TURP
- Remove hyperplastic & friable transitional zone

❖ **Persistent bleeding after TURP**

- **Angioembolism**

❖ **Hematuria with Ca Prostate:**

- EBRT + ADT
- 80% patient respond in 6 weeks of treatment

❖ **Hematuria with Ca Prostate with BOO:**

- Channel TURP

❖ **Severe + recurrent hematuria with Ca Prostate:**

- Palliative cystoprostatectomy with diversion

❖ **Nutcracker Syndrome:**

- Lt. renal vein compression between aorta & SMA
- Increased pressure in (L) RV → rupture of thin capillaries
- Hematuria
- Treatment – RV repositioning

Cyclophosphamide: Due to metabolic acrolyn which stimulate bladder mucosa within 48 hours
To prevent give MESNA
(Mercaptoethane Sulfonate)

Radiotherapy: 6-10 months after RT. vascular endothelial damage causing ischemia.

❖ **First line treatment intravesical:**

Alum 1% (50gm alum in 5 liter @ 200-300ml/hour

Protein precipitation vasoconstriction

Other: Prostaglandins, Aminocaproic Acid, AgNO₃

❖ **Refractory Cases:**

- Intravesical formalin – scaring & fibrosis. Rule out reflux before injecting formalin.
- Hyperbaric oxygen: 100 x 2 at 2-3 atmospheric
- Bilateral anterior branch of iliac A ligation
- Salvage cystectomy with diversion
- Bilateral PCN with ligation of ureter as urine has urokinase.

❖ **Glomerular Hematuria:**

- RBC Casts
- Proteinuria
- Dysmorphic RBC (b/o RBC are squeeze by capillaries)

❖ **Tubular Hematuria:**

- No RBC casts
- No dysmorphic RBC
- Proteinuria

❖ **Urological Cause:**

- No Case
- No dysmorphic RBC
- No proteinuria

	Shape of RBC	RBC cast	Protein urea
Glomerular hematuria	dysmorphic	++	++
Tubulo--intestinal hematuria	normal	--	++
Urinary tract bleed	normal	-	-

Q: why are RBCs from upper tract dysmorphic?

A:

- due to being acted upon by renal macro phages
- Squeezing through glomerular capillaries.

Q: how will you identify the RBC in Urine routine?

R: RBCs are circular, non nucleated

Q: What will you interpret with Urine routine examination depicting dysmorphic RBCs, with casts with proteinurea?

A: Glomerular hematuria.

Q: what are the common causes of glomerular hematuria?

A:

- | Cause | symptoms |
|--|--|
| 1. Ig A nephropathy (Berger's disease) - young pts/ adults (memory aid-young people eat burger) | - responds to steroid
-non responders → methotrexate / CRF pt |
| 2. Alport's disease | - familial nephritis+ deafness
-anti GBM antibodies. |
| 3. SLE | -RAS, arthritis,
-auto immune disease association
-female |

4. good pasture syndrome

-Generalized bleeding tendency + hemoptysis

5. post streptococcal G.N

-H/O recent URTI

Q: what are the causes of non –glomerular hematuria?

A:

- Tubulo – intestinal
- R.V thrombosis
- Reno vascular
- Anticoagulants / Exercise induced.

Q: what is the hall mark of urinary Tract bleeding?

A: Fresh circular RBCs,

No cast, no protein urea.

Q: if Urine routine examination is showing proteinurea; what is the next I_x?

A: 24 hr urinary protein

- 0- 1 gm / 24 hr – normal
- 1-3 gm / 24hr → tubule – intestinal (chiefly low molecular wt proteins & not albumin)
- >3 gm / 24 → glomerular cause (chiefly albumin)

Q: how do you confirm proteins in urine?

A: Add sulfo-salicylic acid & Proteins will precipitate

Q: what will you know type of proteins in 24 hr urinary proteins?

A: By protein electrophoresis

>= 70% albumin → glomerular disease

Tubulo intestinal disease → > 70% IgG & immunoglobulins and only 10-20% albumin

Q: what is the peculiarity of Bence – Jones protein ?

A: dip stick is negative for urine proteins but sulfasalicydic acid test is +ve

- Characterizes multiple myeloma.
- Light chain proteins.

Q: what are the major urological causes of hematuria?

A:

- Urothelial malignancy
- Ca-Prostate
- Ca-Rcc
- UTI
- Stone disease
- GUTB
- Nephrological /medical causes

Q: how will you D/Dx whitish urine?

A;

- Pyuria → on dip stick - pH-alkaline
 - leucocytes +ve
 - nitrite +ve
- On urine routine -pus cells seen
- Phosphaturia → clears on adding acetic acid
- Chyluria → urine having chyle- Triglycerides / lipids.

Q: a 50 year male presents with gross painless hematuria ,What special will you ask in history?

A:

- H/o smoking
- Occupation – Rubber, chemical, dye, Tar, painting worker
- Travel- Egypt-schistosomias
- Drug H/o → Cyclophosphamide, warfarin, anticoagulants, SLE.

Q: what are the common causes of frank hematuria in 50-60 yr /m?

A:

- Bladder TCC 28-30%
- UTI 10%
- Renal calculi 7%
- RCC 5%
- TCC upper tract 5%
- Ca- Prostate 5%

Q: What are in general causes of hematuria?

A:

- Cancer: TCC bladder, RCC, prostate, TCC – upper tract
- Stone : bladder, ureteric, renal
- Infn: TB, Schistosomias, UTI
- Inflm : Cyclophosphamide
- Trauma : Blunt / penetrating
- Cystic : renal cysts, ADPKD
- Vascular : AV fistula, R.V thrombosis
- Nephrological : IgA, Alport's, post – streptococcus, good pasture disease
- Medical: Coagulation disorders, warfarin, sickle cell disease.

Q: What is the relation of blood & urinary stream?

A;

- Blood in the end urinary stream: prostatic urethra, bladder neck
- Blood In the start of the stream: urethral /meatus
- Blood throughout the stream: bladder, pathology, upper tract

Q; why have you asked for pain?

A: painful hematuria → infn, inflm, stone, obstn, -cystitis

Painless: Ca-Bladder

Colic – Upper tract TCC/RCC
-clot colic

Q: what is strangury?

A; **strangury**- “ Slow and painful discharge of the urine, due to spasm of the urethra and bladder.”
From- Dorland's Medical Dictionary for Health Consumers. © 2007 by Saunders

Strangury-“ Slow, painful urination in which the urine is passed drop by drop.”

The American Heritage® Medical Dictionary Copyright © 2007, 2004

- It is the suprapubic pain at the end of micturition
- Slow & painful discharge of urine
- Pain in suprapubic area due to bladder neck spasm-stone /cystitis.

Q: what is dysuria?

A: Burning sensation / pain, while voiding involving usually whole of the ant. Urethra but max. at the tip. It represents urethral pathology usually.

Q: why H/O drug intake is important?

A: antiplatelet agents – aspirin, - clopidogrel

- Only change the fn for platelet
- Doesnot effect number of platelets.

Heparin effects intrinsic pathway leading to abnormal APTT

Warfarin effects: Extrinsic pathway leading to PT/INR abnormal.

Q: why H/O instrumentation is important?

A:

- To see findings of previous cystoscopy if any
- Any h/o VIU Stricture etc.,
- Instrumentation can also cause bleeding

Q: why H/O TB is important in case of ca bladder?

A: may need BCG instillation in future

Q: what weight loss is considered as significant weight loss?

A: 10% weight loss in 6 months

Q: how will you assess wt loss?

A

- Check previous Records
- Subjective – arm/face to lose first
-gluteal fat goes last.

Q: What is the importance of occupational history?

A: following occupations are more associated with TCC

- Paints
- Dye
- Coal tar
- Petrochemical

Q: In how many years the risk of smoker v/s nonsmoker becomes equal after quitting smoking?

A:

- It never becomes equal to non smoker even after quitting smoking
- but almost after equal number of smoking and non smoking years(min . 20 yrs) risk becomes substantially low ,but still slightly higher than non smokers

Q: what is a normal day time frequency?

A: 5-6 /day @ 300ml each

Causes of large amount frequency (polyuria)

- DM
- D.I
- Excessive fluid ingestion
- Diuretics

Q: what is P.T / INR?

A:

- P.T is Prothrombin time; normal 10-14 sec .Determines the clotting tendency of blood .P.T. measures factor I,II, V , VII , X
- INR is the ratio of PT (of patient) / PT (or control).Normal INR is 1.0
- PT/INR → measures the extrinsic pathway of coagulation
- Values raised in warfarin dose / or vit k deficiency

	<i>PT</i>	<i>APTT</i>	<i>Bleed time</i>	<i>Platelet counts</i>
<u>Vit K def</u>	prolonged P _L	normal (N)	normal (N)	normal (N)
<u>Warfarin</u>				
<u>Aspirin</u>	normal (N)	normal (N)	P _L	normal (N)
<u>Uraemia</u>	normal (N)	normal (N)	P _L	normal (N)
<u>Clopilet</u>	normal (N)	normal (N)	P _L	normal (N)

Q: what is APTT?

A:

- Activated partial thromboplastin time
- Depicts the function of intrinsic pathway Factor 8 9 10 11 12
- Normal value = 25 sec – 35 sec (lab dependent)
- Prolonged with use of heparin.

Q: what is Bleeding time?

A:

- time to stop bleeding
- Ivy method & duke's method
- Measures the fn of platelets
- Normal value = 9-10 min
- Values affected by aspirin / Clopilet / DIC / thrombocytopenia.

Q: what is clotting time?

A:

- Time for blood sample to coagulate
- Capillary tube method
- Measure of Ca^{++} and fibrin.

Q: how will you differentiate RBCs from tumour cells?

A: RBCs biconcave flat discs / non nucleated.

Q: what is decoy prostate?

A: when you blame the prostate for hematuria but hematuria is not due to prostate.

Q: If Hb is 9.0 gm%; what causes does it rule out?

A: calculus } does not cause severe anemia
Infection }

Q: how can BPH cause anemia?

A:

- Obstructive uropathy/ CRF
- Recurrent hematuria
- Piles

Q: how many samples will you send for cytology?

A: 3 samples one on each consecutive days

Q why three samples are needed?

A – multiple samples improve the sensitivity

-1 st	40%	} sensitivity
-2 nd	50%	
-3 rd	60%	

Samples :

- Freshly voided ambulatory sample
- 50 ml container

Q: how will urinary cells TCC appear?

A: Hyperchromatic Blue with larger nuclei in small cluster of singles

Q: what stain is used for urine cytology?

A:

- Papanikolaou stain – multi dye stain procedure that uses 5 dyes
Hematoxylin, orange, Eosin, Light green SF, Bismarck Brown
- Initially used for Ca Cervix PAP smear.

Q: can you do cytology in case of hematuria?

A: some people do it with acetic acid used to lyse the RBCs



Q: what are the causes of false positive urine cytology?

- After chemo radiation
- UTI
- Instrumentation
- Indwelling catheter
- Any intravesical therapy

Q: what are the causes of false negative urine cytology?

A:

- Hemorrhage
- Low grade TCC

Q: what is the sensitivity & specificity of urine cytology?

A:

- General sensitivity is 40 – 50%
- Sensitivity increases with high grade(>80% sensitivity) tumours
- > 90% specificity

Q: how can you increase the sensitivity of urine cytology?

A: multiple samples

Barbotage

Q: what are the markers other than cytology?

A: test marker sensitivity specificity

- | | | |
|------------------|----|----|
| • cytology | 50 | 90 |
| • NMP -22 | 70 | 90 |
| • BTA stat | 60 | 70 |
| • BTA trak | 60 | 70 |
| • Urovision fish | 80 | 95 |

Q: What is age / sex distribution of TCC bladder?

A: M:F = 3:1 to 4:1

Age = 70 yrs (rarely < 40 yrs if < 40 yr – well differentiated)

Q: what are the Etiological factors?

A:

1. Genetic
2. External
3. Hereditary

Q: what are the molecular pathways for development of Ca bladder?

A: normal epithelium → 9p- mutations → PUNLMP low grade NMIBC



p53 → CIS → High grade tumours



Q: what are the preventions strategies?

A:

- smoking cessation
- Excess hydration
- Low fat diet
- Multivitamins , zinc
- Green tea extracts
- Celecoxib (cox -2 inhibitor)

Q: how are genetics related to ca bladder?

A: Genetics : N- acetyl Transferase (NAT) detoxifies nitrosamines ; so slow acetylators have increase risk in comparison to fast acetylators .

Q: what are the external risk factors?

A:

External risk factors:

- Aromatic amines,
- Smoking,
- Diet, drinks, drugs
- Infn, inflammation , radiation, chemo.

Amines:

4 – Amino bi phenyl
Arsenic
Benzidine
Toluidine
Naphthalamine

Smoking: 2-6 times risk

Diet: fruit & vegetable are protective

Drinks: Tea / coffee increases risk. More water/ fluid intake less risk

Drugs: acetaminophen (PCM) increase risk

Pioglitazone (antidiabetic)

Infn:

- schistosomias hematobium (sq cell ca)
- Bacterial infn (chronic catheter –sec stone)
- HPV – (SCC)

Radiation: XBRT increased risk

Chemotherapy: Cyclophosphamide. Carcinogenic metabolite of Cyclophosphamide is → acrolein

Q: what are the hereditary risks?

A: family h/o ca bladder increases the risk

Associated with RB – gene, P53 gene, acetylating rates.

Q: what is the histological classification?

A:

- Papilloma, Reactive hyperplasia, atypia
- PUNLMP
- Low grade
- High grade

Q: what is NMIBC?

A: Non muscle invasive bladder cancer.

Q: what are the genes associated with low grade / high grade tumours.

A: Low grade tumours → 9p21, FGF – 3

High Grade tumours → P53, RB gene.

Q: what are the modes of spread?

A:

- Direct
- LVI
- Pagetoid spread (when cancer cells grow underneath a layer of normal appearing surface urothelium)

Q: in which Type will you see Pagetoid spread?

A: CIS

Prostatic urothelium is usually involved on Pagetoid spread

Q: what is the overall sensitivity / specificity of cytology?

A: sensitivity-40-60-% (depending upon grade , high grade has high chances)

Specificity- 95-100%

Q: In which pts bladder Adenocarcinoma ca occurs?

A:

1. Patent urachus , diverticulum
2. Exstrophy
3. Augmented bladder with intestinal segment

Q: what is the most common histological type of ca bladder?

A: TCC

Q: what are rare types?

A: small cell Ca- ' P-NET' } both are aggressive
Micropapillary variant }

Q: with which disease sq. cell carcinoma of the bladder is associated with?

A: Bilharziasis, stone, chronic catheters, Recurrent UTI.

Q: what the Benign Tumours of Bladder?

A:

- P Papilloma
- E Epithelial metaplasia
- N Nephrogenic adenoma
- C Cystitis cystica / cystitis Glandularis
- I Inverted Papilloma
- L Leiomyoma, Leukoplakia



Q: what are the most common symptoms of ca bladder?

A: Painless gross hematuria (85 – 90%)

LUTS → Presence of LUTS is suggestive of muscles infiltration disease or CIS

Q: what % of ca bladder pts will present as gross hematuria?

A: 85% of ca bladder pts will present as gross hematuria.

Q: what % of hematuria patients will have bladder cancer?

A: 15% (25% will have urothelial malignancy, 15% - will have bladder malignancy)

Q: what all lab investigations are done for Ca Bladder?

A:

Urine routine analysis, Urine culture (if urine routine is suggestive of infection)

Urine cytology

Hb, TC, DC, ESR, RBS, Urea, Creatinine, electrolytes

Usg – abdomen + pelvis

Q: what all will you look in USG abd + pelvis?

A: Bladder – mass, number, size, shape – papillary or sessile

Kidney any mass / any HUN

Liver, spleen – for mets

Q: can you predict muscle invasion in USG?

A: Ipsilateral HUN should lead to suspicion of muscle invasion.

Q: What are the bladder tumour characteristics in USG?

A:

Hyperechoic or atleast isoechoic with bladder wall.

Pedunculated / sessile mass is seen

Mass does not change position (bladder clot will change position with change in patient position)

Q: what are the D/Ds for bladder masses in USG?

A:

- Bladder clot: mobile mass; no enhancement on CECT
- Extrinsic tumour/compression: prostatic middle lobe, rectal mass, vaginal -cervical masses.
- Extrinsic inflammation → diverticulitis
- Bladder inflammation: chronic cystitis
- Trabeculation: vary with variable bladder filling volumes
- Bladder stone.

Q: what is stipple sign on IVP for bladder?

A: entrapment of contrast between various frawns of bladder tumour

Q: what does calcification in bladder tumour depicts about grade of malignancy?

A: usually Low grade malignancy

❖ URINE CYTOLOGY

Q: what sample of urine is used?

A: ambulatory, freshly voided, mid stream- whole specimen

Q: what kind of collection bottle is given?

A: sterile but without preservatives

Q: within what time sample should be processed?

A: processing time within 1 hr of collection

Q: what if sample cannot be delivered in 1 hr?

A: if delayed equal volume of ethanol can be added but better avoided take fresh samples only.

Q: can you do urine cytology in Hematuria?

A:

- Usually due to gross hematuria the RBCs will form a layer of cell sheath so that it becomes very difficult to identify the malignant cells in microscopy.. So exam answer is –NO.
- But practically, any weak acid when mixed to urine can cause lysis of RBCs, so that abnormal malignant cells can then be identified in microscopic examination.
- Ideally one can ask the pathologist whether he is comfortable in doing urine cytology with ongoing hematuria
- Still recommended answer is ...”No” urine cytology during ongoing hematuria, if examiner insists then give a relevant answer as per situation.

Q: which solution can be used for lysing RBCs as well fixing slides?

A: use corny’s fixative (Chloroform, alcohol, acetic acid in the ratio of 3:2:1.)

Q: what are the steps in cytology?

A:

1. Collecting jar can take 100ml sample → fill 2 test-tubes for one pt (one test tube = 15ml)
2. Centrifuge the two test-tubes 2000 rpm for 10 min (2 test tubes for one patient)
3. Take sediment out and Put sediment onto 4 slides
4. Albumin (3 drops) is added to each slide for adhesion of cells to the slide.
5. cytospin – deploy its funnel, filter and absorbents and albumin loaded slide ,
6. centrifuge at 750rpm x 5 mins
7. Cytosine automatically makes slide.
8. Take out the slides (total 4 in number for one pt) and put them in fixative (50% ethanol) for 10 minutes.
9. Dry the slide and take to staining machine.
10. Stain with **Papanikolaou stain** (40 min total)

Q: what are the components of Papanikolaou stain?

A:

- Hematoxylin → for nucleus staining
- | | | |
|--|---|------------------------|
| <ul style="list-style-type: none">• Eosin• Orange G• Light green SF• Bismarck brown | } | for cytoplasm staining |
|--|---|------------------------|



Q: what are the principles behind urine cytology?

A: high grade tumours → loss of cohesiveness → more shedding of cells → (Exfoliated cells) more chances of +ve cytology.

Q: what are the sensitivity & specificity for urine cytology?

A:

- General Sensitivity = 50%
 - Low grade tumour = 30%
 - High grade tumour = 70%
- NOCK ET AL
- specificity ≥ 95%

Q: how many samples will you send for urine cytology?

A: Best is- three samples on Days 1, 2 & 3.

Q: what are the sensitivity values of these samples?

A:

- Day 1 – 40%
 - Day 2 – 50%
 - Day 3 – 60%
- sensitivity

Q: what are the causes of the false +ve urine cytology?

A: the false +ve urine cytology can come after

- U.T.I
- Instrumentation
- Indwelling catheter
- Contrast studies
- chemo radiation therapy bladder

Q: what are the causes of false –ve cytology?

A: hemorrhage / Hematuria specimen

Low grade TCC.

Q: how will urinary cells appear in TCC?

A: large hyper chromatic (Blue) cells with large Bizarre nuclei.

Q: how are the various urinary molecular markers?

A

	Sensitivity	Specificity
Cytology	50%	95%
BTA stat/track	60%	70%
NMP – 22	70%	80%
Immunocyt	80%	80%
Uro vision (FISH) (3,7,17,9)	80%	95%



Q: what is the current practical status of urinary markers?

A:

- Only cytology is used as marker practically
- FISH is indicated in equivocal cases
- Combination of cytology + cystoscopy is the best one.

Q: for which chromosomes, currently available FISH probes can detect mutation

A: 3,7,17 & 9 can be detected.

Q: what are the % chances of LN +ve in various stages of Ca-bladder?

A: T1 – 05%

- T2 – 20%
- T3 – 40%
- T4 – 60%

Q: what are the % chances of positivity in angry red lesions and random biopsies?

A:

Angry Red lesions	10%
Random Biopsies (white light)	10%
Blue light	20% added benefit rate
NBI	20% added benefit rate
ReTURBT	30%

Q. Once USG has depicted mass what next will you do (CECT abd+ pelvis or TURBT)?

A: depends upon the characteristics of bladder mass

- | | |
|---|------------------|
| <ul style="list-style-type: none">- if mass size ≥ 3 cm- Sessile mass- Multiple masses- Cytology +Ve | } C.T scan first |
|---|------------------|

For low grade, small < 3 cm, single tumour- direct TURBT should be done.

CT **cannot** depict muscle invasion

CT is done for extra vesicle spread and nodal mets

Q: why CECT first in mass > 3 cm & cytology +ve?

A:

- chances of L.N mets are more
- Post TURBT CECT can have artifacts related to TURBT.

Q: what is super-impose Cystogram or super-impose cystography?

A:

- principle ; detrusor muscle infiltrated with tumour does not contract well
So part of detrusor which is having muscle deep disease or extra vesical spread will not collapse to the same extent as of normal bladder
- Bladder is filled to capacity using a small catheter, block the catheter and take a full bladder film, now empty 100 ml and take the film on the SAME x-ray plate. Empty another 100 ml and take the



film on the same plate .repeat after emptying another 100 ml. This is called super imposed Cystogram.

- The wall of the bladder that is not collapsing is having muscle deep disease or extra vesical disease.

TURBT

Q: Describe the operative procedure of TURBT?

A:

Indⁿ: Urinary Bladder tumour, on imaging studies

Consent:

- Pt is explained about his disease and need for TURBT.
- It is clearly mentioned that it is not a complete treatment and further course of management depends upon the H.P.ex^m report of TURBT.
- It is also mentioned that post TURBT one immediate cycle of MMC will be instituted.
- Other technical points like G/A ,time duration (1 hour) of surgery & complications like infn, Bleeding, need for catheterization, Trauma and bladder perforation are explained

Pre OP day:

- File check & Investigation alignment
- Injⁿ TT, enema,
- Cardiac , anesthetic fitness,
- Part preparation

On the Day of Surgery

- Antibiotics (as per urine culture report)
- Pulse /BP, (if HTN)
- Electrolytes (if need)
- Morning sugar (if DM)

Anesthesia

- Gen anaesthesia + added muscle relaxants
- Surgeon must be present in OT before anaesthesia induction
- Position to be given by surgeon and not technician.
- Ipsilateral leg is doubly secured(so that the leg doesnot move in obturator jerk)
- Contralateral leg is abducted more out(to accommodate surgeon, scope movements)
- Caulty pad on contralateral thigh (if unipolar, so that the current travels towards the contralateral side-thus minimizing obturator jerk)
- Preferable use Bipolar cautry

Do rectal Examination & Bimanual examination under anesthesia--Marshall's staging

Check the instrument trolley 30° – 70° scopes, Otis dilator, Ellick's evacuator, Resectoscope.

- The surgeon scrubs now

Operation: Painting & drapping done

- Take a 15.5 cystoscope sheath & do a urethroscopy, evaluate prostate and enter bladder
- Use saline for cystoscopy
- Look for both ureteric orifices
- Complete a thorough cystoscopic evaluation on Right side fl/by left side.
- Press suprapubically and check dome (invert scope for looking in this maneuver)
- Take 70° scope & check bladder neck area (contd)

Contd TURBT

- Make note of all the tumours and suspected angry looking areas
- Dilate the ant. Urethra using Otis dilator
- Change to continuous Resectoscope
- Use Glycine for resection
- Partially filled bladder
- Measure the size of Bldr tumour
- Keep the loop behind/ beyond the tumour
- Resect with cutting current (piece meal)
- Give wash and collect all superficial Bits
- Take a deep muscle bite & collect separately
- Achieve hemostasis
- Deploy Foleys & start irrigation

Re-do-the Bimanual examination.

Post TURBT give MMC in recovery room as MMC decreases local recurrence by 12% (ABC meta analysis)

Q: what all things will you see for in USG in a case of ca bladder?

A:

1. Heterogenous (hyperechoic) mass protruding into lumen of Bladder; which does not change position (in prone) (v/s blood clot)
2. Bladder wall thickness (n= 5-6 mm)
3. Prostate / median lobe
4. Position of mass (w.r.t ureteric orifice)
5. HUN
6. Liver, spleen, ascitis.

Q: what next → CECT → why CECT?

A: This CT is not for diagnosis of muscle infiltration state but as post TURBT will lead to perivesical stranding & may then mislead the staging: also nodal involvement is difficult to assess.

Q: after TURBT, when will you do CECT?

A: after 21 days

Q: what is the importance of bimanual examination under anaesthesia?

A: bimanual examination used to help in staging of the bladder mass. It was based on the presumptions that

- most bladder masses are palpable in bi manual fashion
- Masses which are limited to bladder only (upto clinical stage T₂), after TURBT should disappear in post TURBT bimanual examination
- Masses which extend beyond bladder limits (stage T_{3b} or beyond), will persist to be felt in bimanual examination done after TURBT.
- With the advent of CT scan this test has lost its importance
- Especially if you have opted for a ct scan examination before TURBT then there is hardly any use of doing bimanual examination
- But, if you have not done CT scan previously and have opted for TURBT straight-away then bi manual examination can be of some help.

The sensitivity and specificity of bimanual examination is very low

At best it can depict intra-vesical limited disease v/s extra vesical spread (that to macroscopic T_{3b}).

Q: what anesthesia is used for TURBT?

A: SA + obturator block

GA + muscle Relaxants (Paralyzing agents)

Q: what is the difference in mechanism of action of the two methods –central v/s obturator block?

A: Lidocaine given in Obturator block, blocks the fast voltage-gated sodium channels in the cell membrane of post-synaptic neurons, preventing depolarization and inhibiting the generation and propagation of nerve impulses. At lower blood concentrations, sensory neurons are primarily affected while at higher concentrations the effects become generalized for motor and sensory both.

Centrally acting muscle relaxants operate by competing for the cholinergic receptors at the motor end plate thereby exerting its muscle-relaxing properties

Q: how will you give Obturator block?

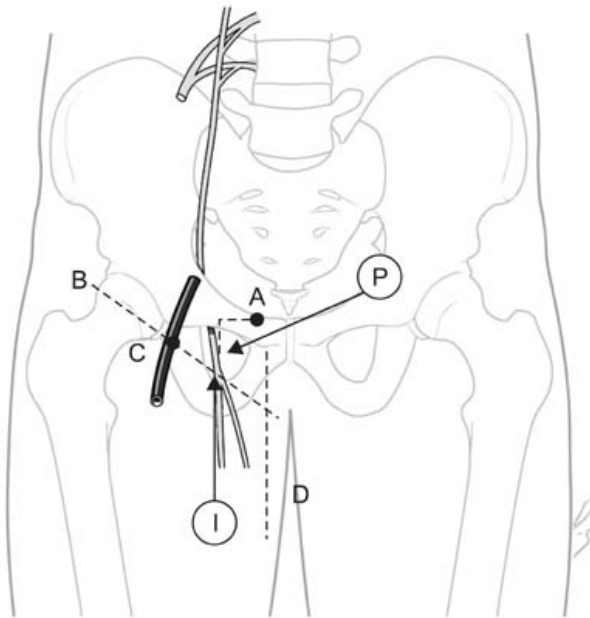
A:

1. Blind technique
2. with nerve stimulator
3. With USG guidance

Classical blind technique is known as **Labat's technique**:

Stand face to face with patient with ipsilateral thigh 30° abducted

- Puncture from the point 1.5 cm inferolateral to pubic tubercle go perpendicular to skin deep with 24 G /8 cm needle.
- Hit the pubic rami.
- Pass underneath and rotate 45° direct towards ipsilateral axilla, move 2 to 3 cm forward → inject 20 ml lidocaine
- Otherwise use nerve stimulator (with adductor jerk) or USG guided
- Please read **the Comparison of the success rate of inguinal approach with classical pubic approach for obturator nerve block in patients undergoing TURB** Korean Society of Anesthesiologists, 2011, Youn Yi Jo,



The obturator nerve block. A: pubic tubercle, B: inguinal crease, C: femoral artery, D: inner border of the adductor longus tendon, P: needle insertion point for the conventional pubic approach, I: obturator nerve.

Q: what else can you do to prevent obturator jerk?

A:

- GA+ muscle paralyzing agents
- Use of Pure cutting current
- Taking Small cuts (rapid paddling)
- Stepwise cuts
- Laser of LASER for that part of tumour fulguration
- Bipolar cautry(bipolar cautry doesnot completely eliminate the chances of obturator jerk)

Q: does use of bipolar cautry lead to elimination of obturator jerk?

A: bipolar cautry doesnot completely eliminate the chances of obturator jerk

Please read ----Monopolar versus bipolar transurethral resection of bladder tumors: a single center, parallel arm, randomized, controlled trial.

[Venkatramani V](#), [Panda A](#), [Manojkumar R](#), [Kekre NS](#).

[J Urol](#). 2014 Jun; 191(6):1703-7.

Q: what will you choose for cutting TURBT?

A:

- 30⁰ telescope
- Pure cutting current
- Half filled bladder
- Continuous irrigation Iglesias sheath with schmidtz visual obturator
- Thin loop
- Glycine irrigation.

Q: how will you resect tumour behind median lobe?

A: raise bladder base with finger in rectum or do TURP median lobe resection.

Q: how will you do hemostasis in TURBT?

A: using Bug bee electrode

Use ball electrode-Remove the electrode from coagulation site before discontinuation of current

Q: how will you identify that the bladder perforation is extra peritoneal or intraperitoneal?

A: findings suggestive of intraperitoneal injury

1. Site of injury (dome)
2. Abd distention (+)
3. contrast is given intravesically (preferable head low position)

Q: how can you confirm that the bladder perforation is extra peritoneal or intraperitoneal?

A: instill contrast intravesically and take X-ray after 5 min

Ground glass appearance –intraperitoneal-needs surgical exploration and repair

If flame like appearance then → extra peritoneal - can be managed conservatively.

Q: how will you enhance the yield of cystoscopy?

A: fluorescence cystoscopy / Blue light / NBI / Optical coherence tomography

Use photoactive porphyrins 5-ALA/ HAL

Inject 2 hour before cystoscopy, Lesion appear red on blue light

22 % added benefit detection rate.

Q: what laser can you use to fulgurate bladder tumour?

A: NDYAG: penetration 6 mm

Q: what is Lintis plastica bladder?

A: when whole of the bladder wall is involved in tumour, like in Lintis plastica stomach.

Q: suppose there is an air bubble in dome and a tumour also?

A: invert the scope, take above the water level & open the outlet

Try changing the position of patient

Put a RCG & suck.

Q: why some intravesical explosions are heard during TURBT?

A: due to air in contact of electrodes. air bubble that comes in contact of electrode gets charged up and hot leading to small blasts intravesically.

Q: what is the composition of air bubble in TURBT?

A: bubble that is generated as a result of resection process is NO₂ and CO

bubble that is generated as a result of frequent in and out instrumentation is equivalent to room air composition

Q: when will you do Re-look TURBT (staging TURBT)?

A: after minimum of 14 days (40% chances are there to get a tumour again)

Change of upstaging from T₁ → T₂ in 25 – 30 %

Q: in what % of tumours “no muscle elements” is seen?

A: 30 – 50

Q: who proposed the theory of tumour seedling due to TURBT?

A: soloway

Soloway studies proved that free tumour cells can seed on to different areas & cause tumour recurrence

Soloway studies also formed the basis of just peri-operative (1-6 hrs) mitomycin-c instillation

Q: Can TURP & TURBT be combined?

A: yes; they can be combined but better avoided

Evidence in literature is spars

Q: do random bladder biopsies increase the chance of tumour seeding?

A: theoretically yes; but practically No.

Q: what is the status of immediate post-op MMC after TURBT?

A: Routine immediate post op mmc is a standard practice in our institute

- Ideally within 6 hrs of TURBT
- Can be given upto 24 hrs of TURBT; no use after that.

Q: On whose work this post op mmc is given?

A: Soloway → free tumour cells can cause seeding

Zinke H- et al → mmc kills free tumour cells and thus prevents seeding .

Please read-- **Intravesical Thiotepa and Mitomycin C treatment immediately after transurethral resection and later for superficial (stages Ta and Tis) bladder cancer: a prospective, randomized, stratified study with crossover design.** J Urol 1985; 134: 1110–1114. Zinke H-et al

Q: what is the advantage of giving mmc post op?

A: reduces the recurrence the rate by = 12% {from 48% to 36% (ABC Meta analysis)}

Q: how much mitomycin do you instill?

A: 40mg for 1 hr

Q: what are the indn for mitomycin maintenance therapy?

A:

- Recurrent T_a-low grade
- 1st time - T₁ low grade .

Q: what else can be instilled (just post operatively)?

A: Epirubicin 50mg, doxorubicin 50 mg

Q: what are the contraindications for mmc instillation post op?

A:

- extensive resection
- incomplete resection
- Bladder Perforation
- Uncontrolled hematuria

Q: can BCG be administered safely on just post op?

A: no, never

Can cause bacterial sepsis & even death.

Q: do you give post op mmc to all TURBT pts?

A: to only those; in whom tumour appear to be low stage low grade
(Single, primary, papillary lesions)

Q: suppose the pt had pre –op urine cytology +ve ; will you still give post op mmc?

A: pre op urine cytology +ve usually means high grade malignancy

There is no proven data that mmc (post op) will help, but there seems no harm also

Final histopathology report may be different than expected one

So I will give post op mmc

Q: what is the mmc maintenance schedule?

A: initial TURBT → cycle -I –mmc wk – 1

Check Biopsy report → cycle- II- mmc wk -2

Cycle- III – mmc wk -3

Re- TURBT → cycle- IV mmc wk – 4

Check Biopsy→ cycle -V mmc wk – 5

Q: when can you give mmc maintenance mitomycin schedule?

A: low grade T_a } ABC -> advanced bladder cancer meta analysis
Low grade T₁ }



Q: what is the gain of mmc maintenance?

A: decrease the recurrence by 12% (ABC Meta-analysis)

Q: Is there any effect on disease progression?

A: No

Q: how can you increase the efficacy of mmc?

A;

- Overnight fasting
- Dehydrating the pt (a bit)
- Using NaHCO_3 (sodium bi-carbonate) oral tab 2 hrs before
- Increase the concentration of drugs
- Microwave therapy.

Q: what are the findings of soloway study?

A:

1. Re-TURBT is must; tumour upstages in 30% cases
2. TURBT leads to tumour seed implant
3. Post op mmc prevents / reduces tumour local recurrence by 12%

Soloway study was later in-cooperated in ABC Meta-analysis.

Q: what is the chance of recurrence of NMIBC tumour?

A: recurrence risk is calculated by EORTC risk calculator of recurrence (by Sylvester)

- No of tumour
- Size of tumour (< 3cm) (>3cm)
- Prior H/O recurrence
- CIS
- Grade stage T_a / T_1

This nomogram can calculate

1. Risk of recurrence after TURBT
2. Risk of progression to MIBC

For Recurrence

- No of tumours
- Prior recurrence
- Tumour size

For Progression

- Tumour category
- Grade
- Cis

Q: in mitomycin –c, what does 'C' stand for?

A: Mitomycins are family of aziridine natural products isolated from “streptomyces”. Not all mitomycins are anti cancer agents. The molecule which is used as “chemotherapeutic” agent is known as mitomycin – C.

Q: what are random biopsies?

A: during cystoscopy, cold cup Biopsies taken randomly from normal looking areas is known as random biopsies.

Q: what are the indⁿ for random biopsies?

A:

- multiple tumours
- Positive urine cytology with negative cystoscopy + negative upper tract imaging.
- Prostatic urethral loop biopsy when neobladder formation is anticipated.

Q: from which parts of bladder will you take random biopsies?

A: one biopsies each from-Trigone, Bladder dome, Right lateral wall , left lateral wall, anterior & posterior bladder walls.

Q: what us the present status of random biopsies?

A: EORTC report says that random Biopsies are not warranted in low risk patients like

- Low grade tumour
- Solitary
- Small
- Papillary tumours
- Negative cytology

Random biopsies are generally taken during Re-look / Re-stage TURBT
(Especially when original biopsy report comes as low grade tumour with cytology +ve)

Thus only pts with

1. +ve cytology;
2. multiple tumours
3. Suspected angry looking areas
4. Contemplating Bladder preserving protocols are subjected to random biopsies

Q: what % of random Biopsies finally comes +ve for malignancy?

A: 10-12% of random Biopsies are +ve when taken from 'High-Risk' pts.

Q: what % of “angry red” areas will finally come +ve for CIS/ malignancy?

A: 10% of angry red areas will finally come +ve for CIS/ malignancy

Q: when will you take prostatic urethra Biopsies?

A:

- Visible abnormalities of prostatic urethra
- Tumour involving bladder neck or Trigone.
- Anticipating the need for Neobladder construction.

Q: how and from where will you take the prostatic urethral biopsy?

A: Take resection loop biopsy between 5-7 'o clock positions.

Q: what is the status of Repeat TURBT?

A: there are three possibilities on initial TURBT report

1. Muscle not seen → repeat TURBT – must
2. Muscle seen → infiltrated → no need of Re- TURBT
3. Muscle seen → not infiltrated.--do re-TURBT.

Consensus statement: Only for low grade low stage Ta(low grade-Ta G₁), Re-TURBT is not needed ;
For everyone else → do Re-TURBT

Q: when will you do Re-TURBT?

A: No fixed time but generally in 4th wk (can be done 2-6 weeks after initial TURBT)

Q: what all will you do in Re-TURBT?

A: complete cystoscopy for new growth / residual growth

Re- resect the previously scarred areas and the resected margins

(Do random biopsies if needed, do prostatic urethra biopsy if needed)

Q: what % of pts will upstage on Re-TURBT?

A: 25-30% upstaging (Soloway et al)

Q: how to enhance the yield (increase sensitivity of cystoscopy)?

A:

- Narrow band imaging (NBI)
- Optical coherence Tomography

Q: what is different in NBI scope or light source?

A: scope is ordinary scope, Light source is different (It has a filter which when turned on gives Blue-green light)

Q: what is the appearance of suspicious area?

A: Brown in colour

Q: How will you assess depths of invasion?

A: Optical coherence tomography

Q: what are the indⁿ for doing photodynamic or fluoroscopic cystoscopy?

A:

- positive urine cytology with no visible Bladder tumours
- History of high grade tumour (in initial resection)
- Contemplating Bladder preserving protocol subject to availability of instrument.
- Subject to availability of instrument.

Q: what is the advantage of fluorescent cystoscopy?

A: 22% added Benefit rate.

Q: what will be the tumour appearance in fluorescent cystoscopy?

A: pink tumour against blue back ground

Tumour cells will absorb more ALA.

Q: what does BCG stands for?

A: BCG commonly referred to as **Bacille de Calmette et Guérin** or BCG

pneumonic to remember BCG effect as there are 30-40% reduction in progression of disease as well as 30- 40 % reduction in recurrence of disease so it is nick named here as BCG₃₀₋₄₀

Q: Who discovered BCG vaccine?

A: Albert Calmette: Physician in pastur institute

Guerin: lab technician (veterinarian)

Q: what is the other major invention by Calmette & Guerin ?

A: anti snake venom

Q: who discovered BCG for Bladder tumour Mx?

A: 1976 Moralles used first

Q: What is the CFU count of Danish 1331 strain ?

A: $2-6 \times 10^8$ CFU /ml

Q: What is the mechanism of action?

A: mechanism of action

Bacteria enters urothelium (micro-pinocytosis)



Release Cytokinins



Dendritic & macrophage stimulation



Activates cell mediated immunity

Q: What are the various strains used?

A:

- Frappier strain
- Danish strain
- Pasteur strain
- Japanese strain (maximum colony forming organism)
- Connaught ,

Q: what is the most important factor you see in the BCG strain?

A: colony forming organism

- More the number of colony forming organism (C.F.U) better is the response
- Dose can be reduced in high 'C.F.O' strains

Q: what happens when bacteria is cultured again & again?

A: bacteria losses virulence but antigenicity is maintained

Q: what is the dose of BCG?

A: 120 mg std dose, but actually depends upon CFU of that strain.



Q: when can you instill BCG after TURBT?

A: atleast 2 wks after TURBT (usually 4 wks).

BCG should not enter blood vessel → causes BCG sepsis/Bacterial sepsis.

Q: what is the dwell time?

A: 1 – 2 hrs dwelling time (Moralles et al)

Q: what is the induction course protocol?

A: Induction course--After 2-4 wks of initial TURBT }
Weekly courses X 6 times } Moralles et al

Q: when to repeat induction course?

A: BCG recurrence

Persistence of CIS

Q: what are the indn for BCG?

A: Intermediate grade or High grade NMIBC or CIS

Q: what is the role of BCG in Ca – bladder?

A: In CIS – complete response 80%

Long durable response 50%

Decreases risk of progression to 20% (otherwise it is 95%)

In T₁G₃ : recurrence risk is decreased by 40% (from 60 → 20)

Delays the interval of progression by 30% (30 → 20 month)

Q: what is the status of BCG in Rx of T₁G₃?

A: T₁G₃ → with any two risk factors like

- size > 3cm
 - multifocal tumour
 - concomitant CIS
- } do early cystectomy rather than BCG.

For T₁G₃ with no other risk factors → given BCG

Q: what are the factors predicting BCG efficacy?

A:

- AGE less than 70 yr (patient's immune system should be working well to respond)
- 1st negative cystoscopy → tumour responding well
- Tumour size < 3cm → good features.
- H/O recurrence
- Early recurrence

Q: what are the good factors for predicting good response in BCG?

1. Age < 70 yr
 2. 1st check cystoscopy – neg
 3. Tumour size < 3 cm
 4. No H/o prior recurrence
- } good factors for BCG.



Q: what are the poor prognostic factors for BCG?

A: Tumour related

- Size > 3cm
- Concomitant CIS
- Recurrence @ 1st check cystoscopy
- Multiple tumours

Patient related

- Age > 70
- DM – uncontrolled
- Immuno compromised Pt

Q: what is the name of BCG Toxicity classification grading?

A: Cleveland (USA) clinic grading of BCG toxicity

Mild, moderate & severe.

Q: what is the m/c side effect of BCG?

A: LUTS

Q: how can you reduce BCG toxicity?

A:

1. Dose reduction = max dose reduction by 1/3rd
2. Dwell time reduction – minimum 30 mins dwell time is required
3. Concomitant use of ofloxacin can be tried
4. Combine with IL₂

Q: what is Cleveland clinic grading of BCG toxicity?

A: LUTS + HEMATURIA + FEVER

	Symptoms	I _x	M _x
GRADE I	LUTS (mild) Mild hematuria Fever (mild) Symptoms =/< 48 hrs	Urine culture Rule out UTI	Anticholinergics Terol-LA Antispasmodic (meftal-spas) analgesics- NSAIDS
GRADE II	LUTS (severe) Hematuria (moderate) Fever (moderate) Symptoms lasting >= 48 hrs	Urine culture LFTS CXR - PA	All above +INH 300 mg /day + rifampicin 600mg/day + consider BCG dose reduction.
GRADE III	LUTS Hematuria (severe) Fever (high grade) Joint pain, Rashes. Solid organ involvement Lung / kidney/ liver Epididymis / prostate	All above	All above + ID reference, +full dose AKT x 3-6 months + consider Prednisolone 40 mg/OD for hemodynamic instability.

Q: what is the effect of BCG on tumour recurrence?

A: reduces the chances of recurrence by upto 40% (30 % to 40 %)

Remember BCG 30-40

Q: what is the effect of BCG in tumour progression?

A: reduces the risk of progressing by upto 40% (30 % to 40 %)

Remember BCG 30-40

- Poor tolerability , IPSS > 15

Q: who suggested the need for maintenance BCG?

A: Lamb et al

Morales → indⁿ course

Lamb / SWOG → maintenance course

Q: who described that “ more than 2 BCG induction cycles are useless?

A: Catalona & Nadler

Q: what is the name of current maintenance protocol?

A: SWOG protocol.

Q: what is current SWOG protocol?

A: Induction course 6 x weekly'

3-x Weekly @ 3 months & 6 weeks & then every 6 monthly for upto 3 yrs

Q: what was the final outcome in SWOG study?

A: recurrence reduction by 40%

Progression reduction by 30%

Q: what is the time for maximum dropout rate?

A: with first 6 months (50% drop out)

Q: what is the present status of BCG maintenance?

A: should be given for upto 1yr atleast.

Q: what are the novel agents for intravesical use?

A:

- KLH → keyhole limpet hemocyanin
- Bropiramine → oral drug
- Garlic extract
- Mycobacterial cell wall DNA extract
- IL – 2

Q: what are the major intravesical agents?

A:

- mmc 40mg
- BCG 120 mg
- Epirubicin 50 mg
- Doxorubicin 50 mg
- Thiotepa rare
- IL₂

Q: how will know that pt is responding to BCG?

A: clinically → appearance of mild to moderate LUTS

Ix → urine cytology and cystoscopy.

Q: Can BCG be given for TCC – prostatic urethra?

A: Yes, Do TURP

- If only mucosa involved T_a, T₁ then give BCG
- If stroma involved – do radical Cysto-prostatectomy.

Q: what is BCG 30-40?

A: for any BCG Rx given Risk redⁿ for recurrence = 30-40%

Risk redⁿ for progression = 30-40%

Herr/Sylvester Study

Q: what is the advantage of early cystectomy (40-80) in T₁G₃?

A:

- 40% of NMIBC on TURBT become MIBC on Cx(cystectomy)
- 40% of T₁G₃ eventually progress to T₂, even after TURBT + BCG indⁿ + BCG maintenance
- Study – ABC meta analysis
- 10 yr survival after early Cx is 80% (stein et al, shariat et al)
- But 10 yr survival after T₁ G₃ + BCG → fl/by C_x is 50%

Q: Can Radiotherapy be given for T₁ G₃?

A: BCG + Radiotherapy can be given

- QOL is very poor
- Response rate is poor.

Q: what are the components of fl/up?

A: PC³

- Phy exam
- Cytology
- Cystoscopy
- CECT upper tract

Q: what are the fl/up protocols for NMIBC?

A:

RISK	phy exam /cystoscopy /cytology	CECT Abd
<i>Low</i>	@ 3months @ 1 yr (9 month after) @ yearly x 5yr	no need
<i>Intermediate</i>	@ 3 mo x 1yr @ 6mo x 2 yr @12 mo x 3, 4, 5 yr	Baseline fl/by @ 2 yrs
<i>High risk</i>	@ 3 month x 2 yr @ 6 mo x next 2 yr @ 12 mo x lifetime	annually x 2 yr then lengthening the intervals

MUSCLE INVASIVE BLADDER CANCER MIBC

❖ **85-90% mortality if left untreated within 2 years for MIBC.**

Tumors initially NMIBC becomes MIBC on follow up having worse prognosis C/C to tumors which are MIBC from starting.

❖ **CECT Abdomen + pelvis along with CT chest is required for metastatic workup.
No role of PET scan for staging.**

❖ **CT scan must be done before TURBT:**

1. To complete work up of haematuria
2. TCC is field change disease to know other lesion.
3. Some patients may lost follow up post surgery.
4. Post surgery may have perivesical fat standing difficult to stage.

But, CT scan

- Can't identify subcentimetric LN
- Can't identify invasion
- Can't differentiate between infection, mass or scar

❖ **Neoadjuvant chemotherapy:**

SWOG trial suggestive of advantages and survival benefits of NAC in mixed histology.

Patient with mixed TCC histology should also offered NAC.

Survival advantages **5-6%**

Pathological complete response rate: **30-40%**

SWOG trial suggestive of:

- **80% 5 years survival if PT0 after NAC**
- **40% if still tumor left.**

• Disdvantages of NAC:

- Delayed definitive upto 3 months.
- Anxiety in patients of having tumor in body.
- Some patients may subjected to over treatments.

- Some tumors may not chemo sensitive → so definitive delayed in management → poor prognosis
- Advantages:
 - Take care of micromets.
 - Down staging of tumor
 - Patients are in ideal time to take NACT.
 - Good survival advantage C/C to adjuvant CT.

❖ **Adjuvant CT:**

- Advantages:
 - Final HPE available
 - Decrease tumor burden and lead to work with for chemotherapy
 - Relieves anxiety in patients
 - Definitive surgery done
- Disadvantages:
 - Difficult to give CT in post operative period
 - Post operative renal deterioration can be present.

Indication:

- **T₃, T₄**
- **Any N+ patients**

❖ **C/I for neo adjuvant CT:**

If patient is C/I for cisplatin then there is no role of neoadjuvant CT.

NACT without cisplatin regime can't be given.

- | | | |
|---|---|-------------------|
| <ul style="list-style-type: none"> - Performance status < 2 - S. Creatinin > 2mg/dl - NYHA disease > 3 - Hearing loss - Neurotoxicity | } | C/I for Cisplatin |
|---|---|-------------------|

❖ **Regimens:**

1. GC

Gemcitabine: 1000mg/ml slowly day 1,8,15

Cisplatin: 70mg/ml day 2

Cisplatin can be given 35mg/ml day-1 and day-2

Repeat cycle every 3 weekly

For 6 cycles

2. DD MVAC: Dose dense:

Mithotraxate: 30mg/ml day 1

Vinblastin: 3mg/ml

Aderiamycine: 30mg/ml

Cisplatin: 70mg/ml

} Day 2

Day 4-11: GM – CSF 200µg/ml

Mycositis

N/V

Alopecia

} are usual ADR.



If with CT counts or platelets decrease then don't stop chemotherapy give GM-CSF units increase dose.

- ❖ If on cystoscopy mass is suspicious for muscle invasive What to do?
Complete TURBT or only Biopsy?

Always tries to do complete TURBT if feasible.

- Complete resection decrease tumor burden
- Decrease burden for NACT
- Better response rate and survival rate if patient is PT0 at time of RC

If suspicious for prostatic urethral involment then biopsy must be taken from 5 and 7 o'clock position - Higher concentration of prostate duct and this is the area where CIS more likely to occur.

❖ **Indication of Radical Cystectomy:**

- MIBC
- Timely cystoscopy indications previously mention
- BCG refractory
- Non TCC bladder mass

Radical Cystectomy has excellent local control.

Only 4% can have local recurrence.

Ideal timing: Within 12 weeks of TURBT otherwise extravesical spread increase and survival advantages decrease

Radical Cystectomy:

Male: Remove bladder, SV, vas bilateral distal portion Prostate With bilateral lower ureter and Trigular fold of peritoneum containing urachus.

Female: Anterior exentration Bladder, ovaries, uterus, cervix and anterior vagina

❖ **Sexual function preserving cystectomy:**

Indication:

- 1. In motivated young patient
 - 2. No multiple tumors
 - 3. No CIS
 - 4. No bladder neck involvement
- } Not a substitute for conventional RC.

- 1. Prostate preserving RC
 - 2. Apical preserving RC
 - 3. Neurovascular sparing RC
 - 4. Prostate and seminal vesicle sparing RC
- } types of SRC.

❖ **Grossly positive lymphnode:**

- **Pre operatively on CT scan outside pelvis**
 - **CT guided biopsy Positive: NACT then RC**
 - **During intra operative frozen section, then RC + Extended lymphnode dissection**
 - **Always complete radical cystectomy if possible. Even if intra operative metastasis is found.**



- ❖ **No definitive recommendation for precise length of distal ureteric margin.**
 - **When frank tumor encountered- dissection upto negative margin**
 - **When for CIC – do resect maximum without compromising length for re implant.**

❖ **Indication for urethrectomy:**

1. **Prostate stromal invasion**
2. **Diffuse CIS of prostate urethra and ducts**

❖ **ERAS: (Enhanced Recovery After Surgery)**

- First treatment programme to improve post operative recovery
- Pre operative nutritional check up:
 - No prolonged NBM
 - No bowel preparation
 - Antimicrobial prophylaxis
- Intra operative:
 - No RT
 - Epidural analgesic
 - Avoid fluid overload
 - Maximum bowel handling
- Post operative:
 - No RT
 - Early mobilization
 - Minimum opioids
 - Alvimopon – receptor antagonist

❖ **Lymphnodes of pelvis:**

1. **External Iliac Group:**
Lateral, middle, medial group (posterolateral to E.I. vein – K/a obturator group)
2. **Internal Iliac Group:**
Junctional LN, Vesceral LN
3. **Common Iliac Group:**
Middle, medial, lateral group

❖ **Indication for urethral surveillance:**

1. **Positive urethral wash cytology**
2. **Palpable mass**
3. **Discharge / blood**
4. **CT / MRI for staging**

Evaluation with scopy and biopsy

❖ **Carcinoma in situ of urethra**

Response to BCG

If invasive tumor: Urethrectomy

Recurrence in case of orthotopic bladder- Do resect circular area of pouch and convert conduit from same pouch.

❖ **25% of patients having lymphnode metastasis at time of radical cystectomy**



❖ **Lymphnode status is an independent predictor of survival and local recurrence**

❖ **Primary landing zone:**

- Internal iliac
- External iliac
- Obturator
- Presacral

❖ **Secondary landing zone:**

- Common iliac
- Para aortic
- Interaortocaval
- Para caval

❖ **Obturator and internal iliac group**

Sentinel LN

- Standard LN dissection – upto iliac bifurcation
- External LN dissection – Aortic bifurcation (common, iliac, presacral)
- Supra extended LN dissection – 2cm above aortic bifurcation

❖ **Boundaries of standard LN dissection:**

Obtural Internal iliac External iliac	Group dissection	Lateral – Genito femoral nerve Medium – Internal iliac artery Superior - ureter crossing iliac upto bifurcation Inferior- (cooper's ligament / cloquel's LN
---	------------------	--

No need to go lateral to EIA. Remove nodes only to Lateral and medial to IIA.

❖ **Fossa of morcille:**

- **Lateral – Psoas major**
- **Medial – L₅ vertebra**
- **Inferior: Upper border of sacrum**

❖ **Famous study for LN dissection in Ca bladder:**

- **STEIN**
- **HER**

❖ **Increased drain output on POD 3-5 - Mostly vascular leak due to blow out of conduit**

❖ **How to differentiate between urine output vs lymphatic output:**

- Fluid creatinine value: > 10 times of serum
- Suggestive of urine leak

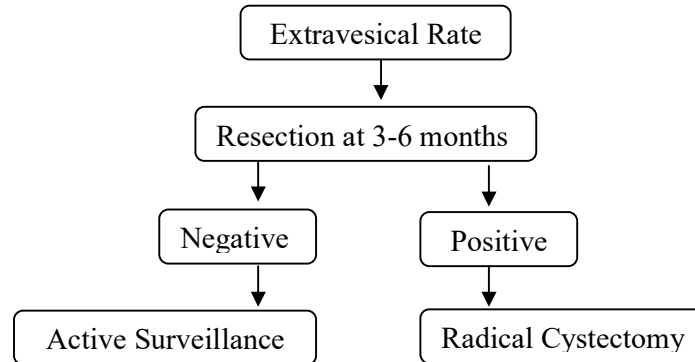
❖ **Radical TURBT:**

- Rationale for bladder preservation surgery:
 1. Curative therapy
 2. Maintaining functionally intact bladder
- Only for highly screened and motivated patient
- Ideal patient:
 1. Size < 3cm
 2. No HUN
 3. No CIS

4. Highly compliant patient
 5. Visible complete TURBT
 6. Good capacity bladder
- Random bladder biopsy required to rule out CIS

❖ **Radical TURBT:**

- Guide resection of tumor site after TURBT upto extravascular rat



- Disadvantage:
 1. Upstage of T_2 to T_3/T_4 – 40% and 10%
 2. Risk of occult metastasis

❖ **Partial Cystectomy:**

- Advantages:
 1. Full thickness bladder wall removed
 2. Lymphnode dissection
- Consideration:
 1. Small < 3cm mass, T_2 lesion
 2. At dome
 3. No CIS
 4. No HUN
 5. Good capacity bladder

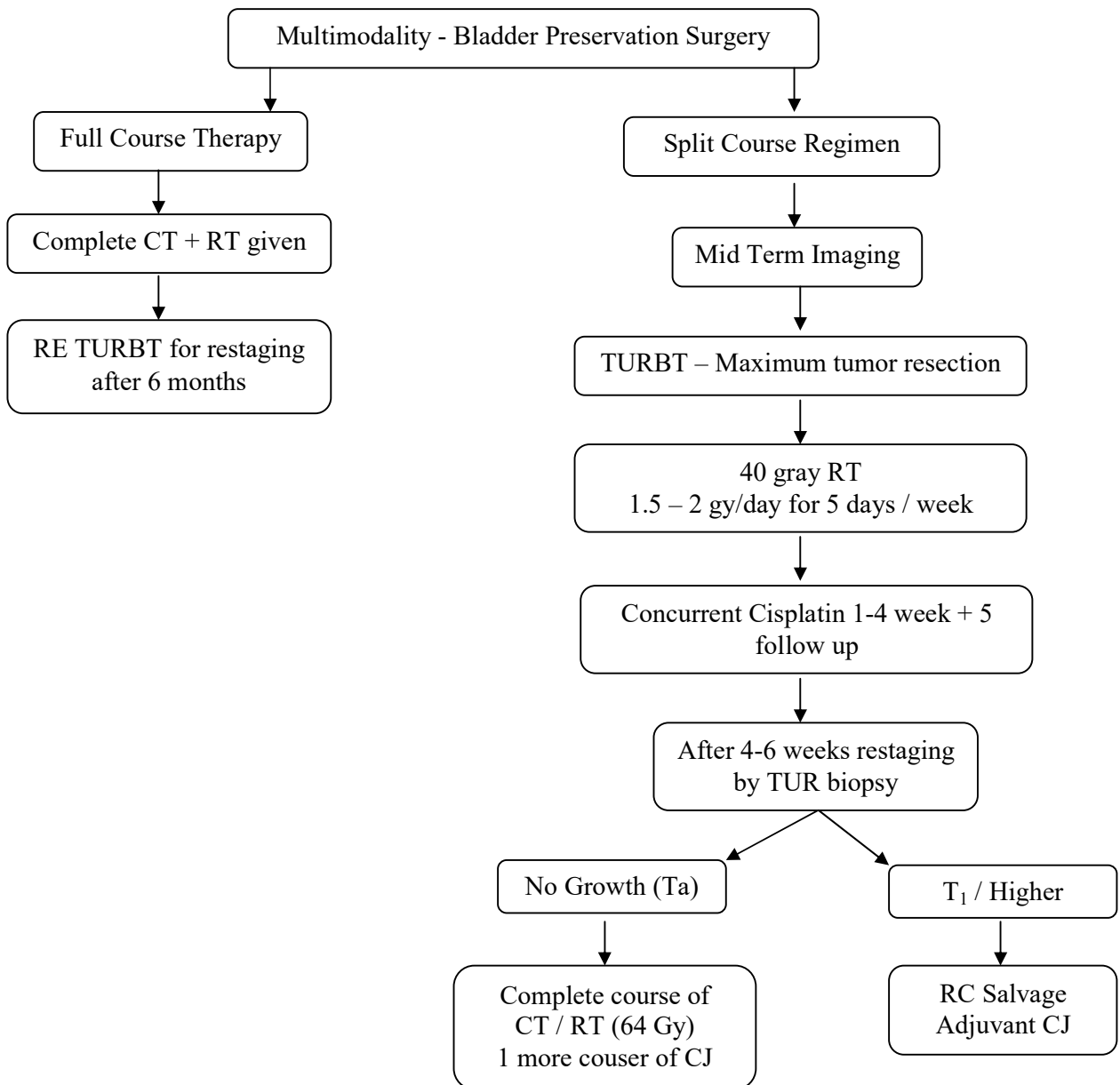
❖ **Follow up**

<u>3 months</u>	<u>6 months</u>	<u>9 months</u>	<u>12 months</u>
PC3	PC3	PC3	PC3
	+ CT Scan		+ CT Scan

- Same every 6 months – 3 years
- Then annually for lifelong



Multimodality - Bladder Preservation Surgery:



- 5 years survival rate – 50%
- Direct comparison of BPS (TMT) & RC not done
- No uniform follow up protocol for TMT
- Disadvantages:
 - Cost of surveillance
 - Side effect of CT / RT
 - No follow up protocol

❖ Poor prognosis factor for chemo response:

1. Visceral metastasis
2. Poor performance status



- ❖ First line treatment for METS:
 1. GC regimen
 2. DD – MVAC regimen
- ❖ Second line treatment for METS: No consensus for second line CT:
 1. Vinflunine – Improves survival by 2-3 months
 2. Poclitaxel
 3. Pomotrexate
 4. Ivabepilone

❖ **Loretaxel: Newer taxel dirovatives:**

Similar to decotaxel

Can activate cancer resistance cell

- Patient who are unfit for gemcitabine based CT
- Pembrolizumob } Immune check point inhibitors
- Atezolizumob }
- Also can be given to Gemcitabine resistant tumors
- Pembrolizumob – “Keynote” trial
- Humanised monoclonal IgG4K PD₁ antibody
- 200mg every 3 weeks
- Nivolumab can be used

❖ **Targeted therapy for TCC:**

1. VEGF Inhibitors:
 - Bevacizumab
 - Sunitinib / Sorofinib
2. ECFR Inhibitors:
 - Cituximab
 - Gefitinib
 - Trostuzumob
 - Lepitinib
3. Apoptotic Pathway: Oblimarsan – Antisense antibody
4. DNA Hypermethylation – Zabilurine – Reverse hypermythylation
5. PIK3 Pathway
6. Proteusome: Bartezumab: Proteosome inhibitors
7. Atezolozumab: PDI antibody

❖ **WHO peripheral neuropathy grade:**

1. Parasthesia or decrease tendon reflex
2. Severe parasthesia or mild weekness
3. Intolerant parasthesia or frank motor loss
4. Paralysis

Q: what is the usual patient profile?

A: A patient roughly age between 60 to 70 ; presenting with gross painless hematuria; USG s/o bladder mass TURBT done; Biopsy s/o muscle infiltration.

Out of all nts of MIBC: what % of nts are de-novo MIBC and what % are NMIBC → MIBC?

- A: de-novo MIBC → 70-80%
NMIBC → MIBC → 20-30%
- T_a → 10%
 - T₁ → 20%

Q: will you like to do a Re- TURBT in this Pt having MIBC as initial biopsy?

A: Not required generally, Only if;

1. A Bladder sparing (partial radical Cx) is contemplated then to do a bladder mapping re-TURBT is done
2. If orthotopic neobladder is contemplated then to take prostatic urethra biopsy (if not taken in 1st TURBT)

Q: What Ix do you want to do?

A: CECT abdomen & pelvis (if not done before)

Sr. LDH, Sr AlkPO₄, Sr Ca⁺⁺, LFTs

Q: when will you do CECT abdomen after TURBT?

A: CECT is done after 21 days → to allow the post inflammatory changes to subside.

Q: which is better option to do CECT before TURBT or after TURBT?

A: pre TURBT – CECT is better as CT detects peri vesical stranding / infiltration as T_{3b} disease

- MRI/CT cannot diagnose T_{3a} disease
- Post TURBT there is more perivesical stranding / infiltration so more chances of over staging
- More over post TURBT nodal involvement is also difficult to assess.
- Some patient are lost to fl/up post TURBT assuming that they are cured

Q: what is Bow sign?

A:

- Bow sign is the persistence of the clear fat between bladder and seminal vesicles.
- If there is perivesical infiltration to seminal vesicles then 'bow' sign is lost (bow angle b/w bladder & seminal vesicle is lost).

Q: what is the Bow sign equivalent in ca PROSTATE?

A: Moustache sign

Q: how good is CECT v/s MRI in local staging?

A:

- Previously MRI was thought to be better than CECT for pelvis or local soft tissue appreciation
T_{3B} = perivesical involvement = better seen in MRI.
- With the advent of 128 slice ct and above ,i.e. 128,256,320 ct scanners, for all practical purposes CT = MRI,
- more advances 128, 320 slice CT scans are more than sufficient enough for diagnosis
- N⁺ nodal involvement = better seen on CT

Q: what size of lymph nodes is considered enlarged in CT scan?

A: more than 8mm in pelvis (ipsilateral of tumour side) and 10 mm in abdomen is considered positive for Ca . Bladder

Q: what is the status of PET-CT in staging Ca-Bladder?

A: Can be used for doubtful nodes.

Q: what metastatic, workup is needed?

A: Sr. Ca^{++} , Sr LDH, Sr AlkPO_4 , CXR-PA

Bone scintigraphy & CT brain if pt is symptomatic.

Q: what is the 10 yr survival for T₁G₃ early cystectomy Cx?

A: 80% (ABC Meta analysis)

Q: what is the TNM staging?

A: TNM classification of urinary bladder cancer (2009)

Tx- Primary tumour cannot be assessed

T0 -No evidence of primary tumour

Ta -Noninvasive papillary carcinoma

Tis -Carcinoma in situ: “flat tumour”

T1 -Tumour invades subepithelial connective tissue

T2 -Tumour invades muscle

T2a- Tumour invades superficial muscle (inner half)

T2b -Tumour invades deep muscle (outer half)

T3 -Tumour invades perivesical tissue

T3a- microscopically

T3b -macroscopically (extravesical mass)

T4 -Tumour invades any of the following: prostate stroma, seminal vesicles, uterus, vagina, pelvic wall, abdominal wall

T4a- Tumour invades prostate stroma, seminal vesicles, uterus, or vagina

T4b -Tumour invades pelvic wall or abdominal wall

N – Regional lymph nodes

Nx -Regional lymph nodes cannot be assessed

N0 -No regional lymph node metastasis

N1 -Metastasis in a single lymph node in the true pelvis (hypogastric, obturator, external iliac or presacral)

N2 -Metastasis in multiple lymph nodes in the true pelvis (hypogastric, obturator, external iliac, or presacral)

N3 -Metastasis in common iliac lymph node(s)

M – Distant metastasis

M0- No distant metastasis

M1 -Distant metastasis

Q: what is the survival probability for a pt who is diagnosed as MIBC at TURBT biopsy?

A: 5 yr survival is 50%

Q: Does it mean that for all pts undergoing radical cystectomy 5 yr survival is 50%

A: Actually it is in general survival rate. Final Histopathology reports matters including

- Perivesical spread
- Number of lymph nodes
- Level of LN involved
- Histology of tumour

Q: what is the survival for different stages?

A: T₂N₀M₀ → 5 yr survival 60%

T₃N₀M₀ → 5 yr survival 40%

T₄ / or nodal disease → 5 yr survival 30%

Metastatic disease → 5 yr survival 15%

Q: what is the survival advantage after neo – adj chemotherapy?

A; 5 yr survival will improve by 5%

Nordic trial, SWOG Trial and ABC Meta analysis Reports

Q: when can you not give neo adj chemo Rx?

A: Poor performance status PS > 2 (ECOG)

Impaired renal Function

Q: within what speculated time (of diagnosis) the radical cystectomy should be performed

A: within 90 days of diagnosis

Q: will you do only cystectomy or cystoprostatectomy?

A: cystoprostatectomy rather Cysto-prostate-seminovesiculectomy.

Q: Why is prostate also removed with Rad Cx, whereas bladder is not removed in Rad prostatectomy

A:

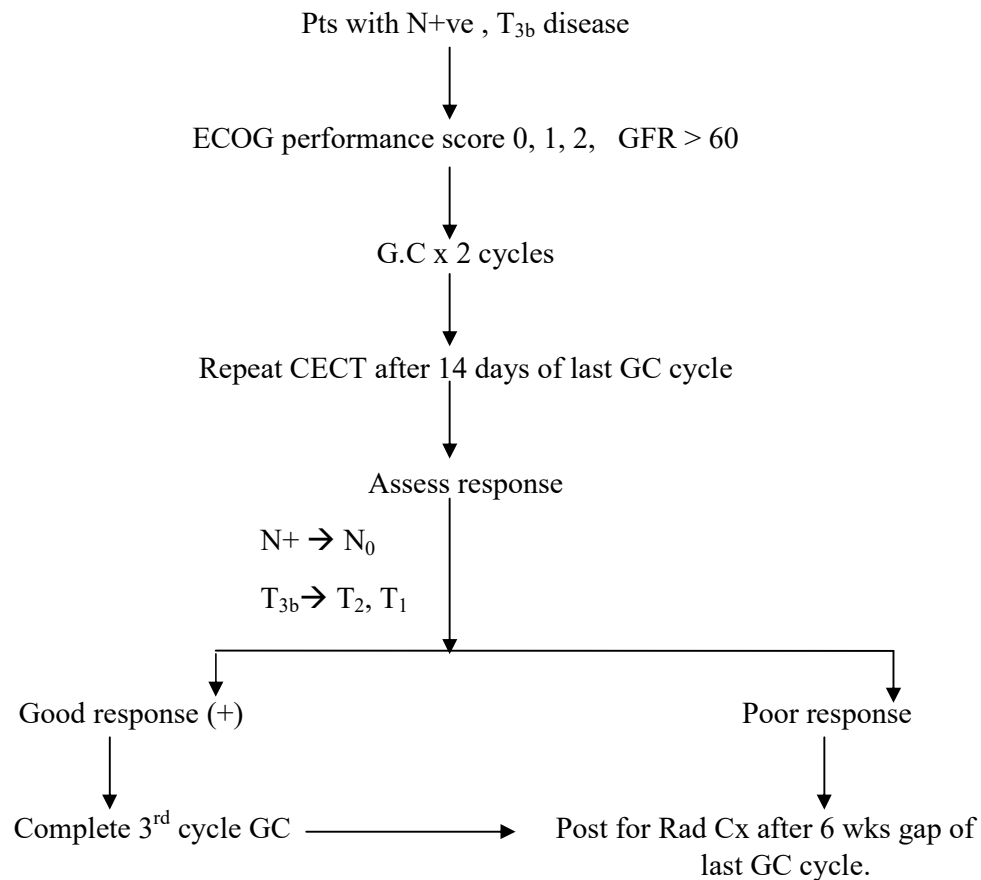
- Ca bladder is a field change disease. Prostatic urethra & ducts are also lined by Transitional cells, So prostate is removed with Radical cystectomy
- Whereas Ca- Prostate is Adenocarcinoma, it is a glandular epithelial (columnar epithelial) disease. So no need of doing cystectomy along with radical prostatectomy.

Q: what percentage of radical Cysto-prostatectomy specimen will histopathologically show indolent Ca prostate?

A: upto 25%

Q: how will you proceed for neo adj chemo & rad Cystectomy?

A:



Q: will you do lymphadenectomy with Rad Cx?

A: Yes; always

- Hope= Hypogastric LN
 - Obturator LN
 - Presacral LN
 - External iliac LN
- } pelvic L.N. are definitely removed

Q: when can you do Rad Cx after GC cycle?

A: 4-6 wks after last cycle is over.

Q: Describe the Operation Radical Cystoprostatectomy?

A:

Indⁿ

1. Muscle invasive bladder cancer T₂
2. T₁G₃ early cystectomy.
3. BCG refractory
4. TCC in diverticulum
5. Non TCC – Ca bldr.



Consent:

- Pt is explained about his disease and the diagnosis – MIBC;
- The need for surgery
- The prognosis (5 yr survival 50-60%)
- Organ removed – bladder, - prostate, seminal vesicles
- Pt is explained about ileal conduit & complication
- VAS deferens ligation
- Erectile dysfn
- Gen compln: infn, bleeding, Trauma.

Pre Op Prep

1. blood reservation
2. Only liquid diet from morning on the day before surgery
3. Oval peglec at 12 to noon
4. NBM 12:00 midnight
5. Ileostomy site marking
6. Inform pathology deptt for frozen section preparation
7. Part preparation nipple to knee.

On the day of sx

- Morning serum electrolytes, pulse /BP/RBS
- antibiotics → cephalosporin +Metronidazole

Anesthesia: General anaesthesia

Patient position: supine position may be used with table break at pelvis

Low lithotomy – Prostate push, anal dilation, rectal flatus tube
Trendelenberg 15°
Leg slighted separated.

Do foley's catheterization + Flotran boot applⁿ sequential compression device.
Operating surgeon stands on the left side of pt.

Incision:

Midline vertical infra umbilica,l from 2 cm above the umbilicus to pubic symphysis.

Steps:

1. make a midline vertical incision
2. Open the skin, subcutaneous, rectus sheath
3. Enter the “space of Reitz” extra-peritoneally and develop the perivesical space pockets on both sides.
4. Open the peritoneum above the level of umbilicus & detach the urachus from umbilicus
5. Cut the peritoneum bilaterally upto the internal inguinal rings (lateral to medical umbilical ligament)
6. Clamp the urachus and pull it out of the incision wound.
7. Reflect the ascending colon / caecum and expose the iliac vessels(on right side). Reflect the descending colon medially and expose the iliac vessels (on left side).
8. Complete the lymphnode dissection in standard template.
Boundaries of L.N. dissection are
Superiorly : crossing of ureter over iliac bifurcation
Inferiorly : coopers ligament

Laterally : genitofermoral – nerve

Medially : internal iliac artery.

9. All L.N. packets are separately packed and sent for HP examination (Bouchner's maneuver). Deploy a self retaining / book Walters retractor system & pack the bowel away.
10. Ureter is ligated as low as possible and cut. Distal ends may be sent for frozen section
11. Once the lymphnode dissection is complete the bladder is retracted medially so that the superior vesicle & lateral vesicle pedicles get taught and they are dissected ligated & cut.
12. Once the superior & lateral vesicle pedicles are ligated & cut, the bladder can be lifted out of the wound
13. Pull the bladder with urachus out towards pubic symphysis this will tent up the peritoneum b/w bladder & rectum. Make a nick in the peritoneum b/w posterior wall of bladder & rectum.
14. With the use of right hand do blunt dissection and make a plane b/w bladder & rectum
15. Vessels will be seen entering the base of the bladder from posteriorly & bilaterally. This is posterior pedicle. Clip & cut the posterior pedicles bilaterally.
16. Open the Denonviller's fascia between prostate & rectum, separate prostate from rectum. Reach upto the apex of prostate.
17. Drop back the bladder into the field and pull & depress the bladder down wards. This will tent-up the endopelvic fascia which is then opened bilaterally.
18. Manipulating & pulling the bladder; the prostate is coned down upto apex.
19. Dorsal venous complex is ligated distal to the apex; cut; and fixed to pubic symphysis.
20. Prostatic apex is divided from urethra.
21. If a non nerve sparing cystoprostatectomy is being performed then wide excision of neurovascular bundles is done and specimen delivered.
22. Pack the pelvic cavity with sponges.
23. Complete the ileal conduit formation.
24. Deploy urethral foleys as pelvic drain
Deploy one abd drain
Close layer wise
Ileostomy formation.

Q: How will you manage post op period?

A: shift the pt to recovery / ICU

- Post op ECG,
- Post op Hb, PCV, Sr. electrolytes.

Day - 0 – Temp, pulse, BP, SPO₂, vitals.

Post op, ECG, Hb, PCV, electrolytes

Watch for acidosis (blood loss, ischemia)

Day- 1- Urine output, drain /Output, Temp, P , BP, RS/CVS, ABG

Arterial blood gases analysis with electrolytes, look for ileostomy status & appearance.

Q: what are the major compln of Rad cystectomy?

A: Intra Op

- Hemorrhage
- Rectal injury
- Nerve injury

Immediate post op

- DVT

- Ileus
- Bowel leak
- Lymphocele
- Secondary hemorrhage
- Wound infn
- Ileostomy necrosis
- Stent dislodgment

Late post op

- Short bowel syndrome
- Metabolic compln of ileal conduit
- Ureteric anastomotic stenosis.

Q: what is the presentation & Mx of Pulmonary embolism?

A: more than 48 hrs of bed rest.

Unexplained desaturation.

Tachycardia, Tachypnea.

CECT chest → see for pulm embolism

Mx → heparin 5000 units s/c or slow infusion.

Q: what is the blood supply of bladder?

A: bilaterally

- Superior vesicle
 - Inferior vesicle
 - Posterior pedicle
- } lateral pedicle

Superior & inferior vesicle arteries are B/O anterior division of I.I.A.

Posterior pedicle is branch of posterior division of IIA

Q: what are the branches of anterior division of I.I.A.?

A: Anterior division of I.I.A gives 7 branches

1. Superior vesical
2. Interior vesical
3. Uterine
4. Interval pudendal
5. Sup. rectal
6. Obturator
7. Inferior gluteal

Q: what are the major points of bleeding in Rad Cx?

A:

1. Lateral pedicle
2. Posterior pedicle
3. DVC complex.

Q: how will you identify lateral pedicle, i.e. superior & inferior vesical arteries?

A: retract the bladder to opposite side and pull the IIA to ipsilateral side this tents up the branches of anterior division of IIA.



Q: how will you identify posterior pedicle?

A: lift up the bladder (with the help of urachus) upward & out of wound, this will initially tent up Denonviller's fascia.

Enter the space b/w rectum (below/posteriorly) and bladder/seminal vesicles anteriorly.

On providing further traction the posterior pedicle will be seen as pillars running up from the lateral sides of rectum to bladder, doubly clip & cut.

Q: How will you control DVC?

A: Take a vicryl 1-0 or 1 number and apply "figure of eight suture" on DVC complex and fix it to pubic symphysis.

Q: what are the layers of fascia between bladder & rectum?

A: peritoneal layer covering the dome of the bladder dips to a variable depth to fuse with peritoneal layer covering the interior wall of rectum. This variable depth pit formed b/w the two peritoneal layers is called pouch of Douglas.

After fusion of these two peritoneal layers the fused sheath is called Denonviller's fascia. So Denonviller's fascia is two layered structure; layers being fused with each other are practically inseparable.

Purely, for the purpose of description the surface of Denonviller's fascia toward the bladder and prostate is called anterior sheath and that towards the rectum is called posterior sheath.

The Denonviller's fascia continues caudally to fuse with endopelvic fascia.

Q: what is the plain of dissection b/w rectum & bladder?

A: the anterior layer of Denonviller's is very difficult to dissect from posterior surface of bladder, prostate & seminal vesicle.

So plain of dissection b/w rectum & bladder is b/w posterior surface of Denonviller's and rectum wall.

Q: In which condⁿ the separation of bladder and rectum is difficult?

A:

1. Prior TURP
2. Prior pelvic radiations.
3. Prior pelvic Sx
4. Bldr tumour infiltration into posterior vesicle space.

Q: what type of dissection is done to separate bladder from rectum?

A: In normal condⁿ → both blunt & sharp

In difficult situations → only sharp dissection.

Q: how will you manage intra op rectal injury?

A:

- 5% incidence
- Immediate repair (2 layer) – mucosa, - Lambert suture – interpose omentum (if needed)
- Make decompressing diversion colostomy
- Deploy pelvic drain.

Q: how can you prevent DVT?

A: intra op – flotron-sequential compression device

Post Op – early mobilization, - claxane (LMWH)

Q: what is standard and extended LN dissection?

A: Standard LN dissection → means removal of hypogastric obturator & ext iliac L.N.

Extended LN dissection means → removal of pre sacral group and common iliac LN also (upto bifurcation of aorta)

Q: when will you do standard & extended LN dissection?

A: standard → in clinically N₀ disease

Extended → in clinical N₁/N₂

Q: what is the morbidity & mortality of rad Cx?

A: peri operative mortality 3%

Early complication (upto 3 months of sx) = 25%

Late morbidity is according to type of urinary diversion.

Q: what is the survival after Rad. Cystectomy?

A: for pT₂ 5 yr survival = 60%

For pN_{1,2} 5 yr survival = 30%

Q: enumerate the steps of radical Cx in females?

A: lithotomy position –mandatory

1. Infra umbilical , midline vertical incision
2. Layer wise opening
3. Development of space of Reitz & perivesical pockets
4. Open peritoneum above umbilicus
5. Cut the urachus & peritoneum upto DIR bilaterally
6. Complete the lymph node dissection
7. Ligate & cut the ureters
8. Control the superior vesical artery & lateral pedicles
9. Once anterior control is over; enter the space behind uterus (b/w uterus & rectum)
10. Complete TAH like hysterectomy
11. Make a nick in post vaginal wall.
12. Extend the vaginal vault incision down along the lateral wall of vagina bilaterally upto exterior.
13. Dissect the space of Reitz; incise the endopelvic fascia and dissect the anterior wall of urethra upto exterior.
14. Deliver the specimen out
15. Close the posterior vaginal wall on itself.
16. Complete the ileal conduit.

Q: What are the most common sites of mets in ca bladder?

A: lung, liver, bones

Q: what are the % chances of LN involvement?

A:

T₁ – 05%

T₂ – 20%

T₃ – 40%

T₄ – 60%

Q: what is the role of PET-CT for LN status?

A: FDG – PET }
11c-PET } can be used

Q: what are the commercially available biomarkers?

A: CEA/ CA-125 / CA 19-9

Q: what are the absolute C/Indⁿ for urethral sparing surgery?

A

- Bladder neck tumour in female
- Urethral involvement in female
- Prostatic stroma involvement in male
- Posterior based tumours are relative C/Indⁿ

Q: why do you want to remove uterus in ca bladder?

A: bladder lymphatics travel through broad ligaments, so it is imperative to remove uterus.

Q: what are the boundaries of LN dissection?

A:

- Superiorly – ureter crossing the iliac vessels
- Inferior – cooper's ligament
- Laterally – genitor femoral nerve
- Medially – int. iliac artery.

Q: what will you see in L.N. biopsy?

A:

- Total no of LN
- Total no of +ve LN
- Lymphnode density

Q: what is the most important database in ca bladder?

A: SEER-Surveillance Epidemiology and End Result

Q: what is packeting of separate L.N. groups called?

A: Bouchner's maneuver.

Q: what stage is becomes if nodal mets above common iliac bifurcation?

A: M₁

Q: what is the minimum number of LN to be removed?

A: 12 (AJCC)

Q: what is maximum number of LN to be removed?

A: 30

Q: what is extended LND & standard LN dissection called?

A: Skinner's opⁿ → extended LND

Marshall's Opⁿ → std. LND.

Q: suppose while doing Cx you encountered a visible enlarged node/s what will you do?

A: send the nodes for frozen section, Proceed as planned for Cx, preferably do as extended L.N.D



Q: when will you abandon the procedure?

A: I will abandon Cystectomy, when

- L.N. are unresectable
- Tumour is unresectable –
- peri ureteric infiltration,
- fixed to Recto-sigmoid
- Fixed to pelvic side wall.

Q: what will you do if there is CIS/ intra op frozen section positive at ureteric margin?

A: CIS @ ureteric margin is of low significance

Does not alter the risk of development of subsequent tumour. No hard & fast rule to achieve margin –ve

On left side don't bother and concentrate on the length of ureter.

On right side Re-chop margin as there is adequate ureteric length

Q: when will you do urethrectomy in males?

A: diffuse CIS in prostatic Urethra

Stromal invasion of prostate

+ve apical urethral margin.

Q: what does Stromal invasion of prostate depicts?

A: risk of secondary primary tumour in retained urethra is very high

Q: when will you not do urethral preservation in females?

A:

- Cancer at bladder neck
 - T₄ stage involving vagina
 - T₃ tumour of bladder trigone
- } C/Indn for orthotopic neobladder also.

Q: what % of pts will finally die of mets?

A: 50% will die of mets.

Q: what is the benefit of neoadj chemotherapy?

A: 5% survival benefit @ 5 yrs

Q: what are the chemotherapy options?

A:

- M-VAC
- gemcitabine +cisplatin

Q: what are the bladder preserving protocols?

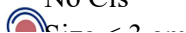
A:

- Radical TURBT
- Partial cystectomy (Cx)
- Bimodality therapy
- Trimodality therapy

Q: what are indn for radical TURBT?

A: Initial occurrence / 1st time

No Cis



Stage T₂
C/I → at dome (do partial cystectomy)
→ T_{3B}, T₄

Q: what is the status of radical TURBT for Rx of MIBC?

A: Not advisable

Q: what is the status of partial cystectomy?

A: only for Adenocarcinoma of urachus.

Q: what is the status of multimodality bladder preserving strategy?

A: only for highly selective patients

- T₂ on initial resection & on repeat resection
- Unifocal
- NO CIS
- No HN
- Pt well compliant to fl/up

Q: what are the results of multimodality Rx?

A: Overall survival 5 yrs = 50% @ 5 yrs

Bladder presentation success = 50% @ 5yr.

Mild to moderate toxicity of chemo /radiation = 50%

Q: what percentage of T₂ N₀ M₀ pts will become pT_{3a} / N₊ after radical Cx?

A: 10-20%

Q: what will you do for such patients?

A: give adjuvant chemo Rx [regimen G.C x 3 cycles]

Q: what is the survival benefit of giving adjuvant chemo Rx to such patients?

A: overall survival benefit is doubtful or not established. In any case it is less than 5%.

Q: What is the guideline statement for giving adj chemotherapy to these patients?

A: Recommended to give under trials or under care of oncologists

Not for routine use.

Q: Is there a role of adj radiotherapy?

A: as N+ve disease is equivalent to systematic disease; practically there is no use of adj radiotherapy.

Q: what is the status of neo adj EBRT?

A:

- Neo adj radiotherapy is good & effective
- Dose – 50 Gy (atleast)
- T_{3b} to T₂ conversion rate is >= 50%
- Reduces risk of local recurrence by 30%
- Improves survival by 5% to 10% (doubtful) (not supported)

Q: after what time gap will you do radical cystectomy after neo adj EBRT?

A: after 6 wks

Q: can neo adj EBRT converts cT₂ tumour to pT₀ ?

A: yes, about 50% of cT₂ become pT₀ but No cT₃ will become pT₀.

Q: what is the difference in indications for neo adj chemo & neo adj Radiotherapy?

A: neo adj chemo → for node +ve disease

→ Aim is to control micromets

Neo adj radiotherapy → for cT_{3/4} disease

→ Aim is to make disease operable.

Q: what are the guideline recommendations about neo adj EBRT?

A:

- Should be given to T₃ / T₄
- Results in down staging after 4-6 wks
- Doesnot improve overall survival
- Only makes the disease operable.

Q: what is the schedule of EBRT?

A: 2 Gy daily for 5/7 days a wk x 5 wks

Total = 50 Gy

Q: what is the sensitivity & specificity of frozen section?

A: sensitivity 70%

Specificity 98%

Q: why is there false –ve in frozen section?

A: Because specimen is frozen in cryostat which leads to cellular disintegration & artifacts

- So false –ve.

Q: describe the process of frozen section?

A:

- Specimen → put in fixating solⁿ gel → freeze → fix on cutting machine → cut thin slices → keep on slide → stain → examine.
- Fixing solⁿ → poly vinyl alcohol
- Freezing machine → cryostat
- Freezing temp → -30⁰
- Cutting machine → microtone
- Stain = H& E

- Specimen is immersed in poly vinyl alcohol and kept in cryostat. Both specimen & fixating soln become frozen & sock hard at -30⁰ c. thin slice of 10 μm is cut by microtome and stained & examined.

Q: what is clinical stage T_{4b}?

A: tumour infiltrating abdominal wall / pelvic wall.

Q: what are the symptoms of T_{4b} (locally advanced)?

A:

- recurrent Bleeding
- Pain

- Dysuria
- Urinary obstⁿ & uremia
- Severe LUTs (urgency, frequency)

Q: what is the mechanism of urinary obstⁿ in T_{4b}?

A:

1. Mechanical obstⁿ of ureteric orifice by tumour
2. Infiltration of ureteric orifice leading to interference with urethral peristalsis
Both of these factors lead to uraemia.
3. Compression by lymphonodes.

Q: what are the management options?

A:

- Palliative cystectomy + Percutaneous ureterostomy + radiotherapy
- Palliative cystectomy alone (symptom relief)
- Radiotherapy alone (symptom relief)

Q: what is the 'm' staging in TNM?

A: M₀ → no metastasis

M₁ → distant metastasis

Q: what are the sites of distant mets in Ca bladder?

A: lung, liver, bone

Q: what % of pts have metastatic disease?

A: NMIBC – 7- - 8%

MIBC – 20 – 30 %

Q: what % of pts will eventually have metastatic disease after Rad Cx?

A: 50% of pts undergoing radical cystectomy will relapse in the form of metastasis. Hence dose fl/up is necessary.

Q: how will you stratify the patients with Ca- Bladder metastatic disease?

A:

- Assess for ECOG-Performance status. PS- 0,1,2,
- GFR
- Comorbidities

Stratification according to EORTC trial, European organization for Research & treatment of cancer.

Q: what are the three fitness groups (EORTC-group)?

A:

1. Fit for cisplatin based combo – chemo
ECOG 0-1; GFR>60
Chemo Advised → G.C, m-VAC, HD-MVAC
2. Unfit for cisplatin based combo - chemo
ECOG 2 GFR< 60 ml /min
Chemo advised: Gemcitabine + carboplatin
M-V.A.Carbo

3. Not fit for any combo chemo
Only single drug agent chemo therapy
ECOG > 2, GFR < 30

Q: what is the outcome after Rad Cx?

A:

Stage I -80%	}	5 yr survival
Stage II -70%		
Stage III- 40%		
Stage IV-30%		

Q: what are the factors required for bladder preservation?

A:

1. Clinical stage – organ confined
2. Pt motivated / ready for fl/up
3. Tumour < 3 cm
4. Unifocal
5. No HN
6. RFT – normal for giving cisplatin.

Q: what are the molecular markers in MI-Ca bladder?

A:

- Cell surface – CA 19-9, CA -125
- Growth factor TGF- β_1
- Cytokines IL₆
- Cell degradation: E-Cadherin
- Cells – CTC
- P53, Rb gene

Q: what is Karnofsky performance scale?

A:

- 100 – normal person
- 90- normal with minor symptoms
- 80 – normal with symptoms
- 70 – able to self-care
- 60 – occasional assistance needed
- 50 – frequent assistance needed
- 40 – disable
- 30 – severely disabled
- 20- hospitalized
- 10 – moribund
- 00 – dead

Q: what is ECOG score?

A:

- 0 – normal
- 1 – symptomatic but completely ambulatory (0% bed)



- 2 – less than (<) 50% in bed
- 3 – More than 50% in bed
- 4 – 100% bed bound
- 5 – Dead

Q: suppose pt stage is T₂N₂ or T₂N₃ , what management will you do?

A: neo adjuvant chemo + Radical C_x + adjuvant chemo +/- XBRT

Q: what management will you do for T₃ N₂?

A: Do Ex^m under anesthesia if bladder is mobile, free from rectum & free from pelvic side walls → Rad C_x + chemo

If not → Neo adj chemo + Rad C_x

❖ **Role of mechanical bowel preparation:**

- It can decrease the fecal load and total number of bacteria but not the bacterial concentration.
- Mostly it is done with Poly ethyl glycol solution.
- 20-30ml/min until clear effluent is passed or give 4l of fluid.
- Keep NBM for 12 hours and IV fluid support.

❖ **Role of antibiotic preparation:**

- It can decrease infection and wound complication rate.
- Preparation is done with 3rd generation cephalosporin plus metronidazole.
- It can increase diarrhoea, pseudomembranous colitis, oral thrash and nutritional deficiency.

❖ **Principles of bowel anastomosis:**

1. Proper exposure
2. Tension free
3. Vascularity must not be hampered
4. No spillage
5. Serosa to serosa water tight closure
6. Mesenteric re alignment

❖ **Causes of deterioration of upper tract after uretero ileal anastomosis:**

1. Lack of ureteric motility
2. Infection
3. Stone
4. Less commonly anastomosis stenosis

❖ **It is not established that reflux associated with normal ureter in the absence of obstruction is detrimental.**

- Advantages of non refluxing anastomosis: theoretically decrease the risk of reflux and decrease pyelonephritis.
- But same time surveillance is more difficult.
- More risk of obstruction.
- Difficult to construct.

❖ **Principles of uretero intestinal anastomosis:**

Mobilization of adequate ureteric length

- **Stripping of only 2-3mm of ureter**
- **Bowel should be brought to ureter not the ureter to bowel**
- **Mucosa to mucosa anastomosis**
- **Post anastomosis bowel is fixed in the abdominal cavity to prevent rotation and torsion of loop.**
- **It is fixed mostly to sacral promontory or to the rt upper quadrant above rt colic artery.**

❖ **Uretero ileal anastomosis:**

- **Bricker's anastomosis:** end to end anastomosis
 - Simple to create and less complications
 - If recurrence is there then both the ureters are not involved.
 - More chances of stenosis.
- **Wallace anastomosis:** end to side anastomosis
 - One end of ureter to other end of ureter
 - Y type anastomosis
 - Loop down anastomosis
 - 1.5 to 2cm spatulation should be done.
 - Lower risk of stenosis and stricture
 - But if recurrence then both the ureters will be involved
 - Extensive CIS and ureteric involvement are contraindications.**
- **Le duck**
- **Hammock**
- **Ureter dipping**
- **Subserosal extramucosal ureter** - are some of other anastomosis variety.

❖ **Uretero colonic anastomosis:**

- **Nonrefluxing type:**
 - Laddbater
 - Goodwin
 - Pagano
 - Strickler
- **Refluxing:**
 - Neisbit's
- **Lowest complication in ureterocolonic - Pagano variety**
- **Uretero ileal - Le Duc variety**
- **Lowest stricture rate: Wallace method**

Management of anastomotic stricture: endoscopic balloon dilatation/ open surgery/ stent

Poor result with balloon: left ureter stricture

Stricture > 1.5cm

Stent is an option for poor risk patients.

S.creat < 2 then patient can tolerate bowel very well in urinary tract.

If s.creat is >2 then look for

- 1. PH of <5.8 with ammonium load**
- 2. Osmolarity of >600 or high with water deprivation**
- 3. eGFR >35ml/min**
- 4. minimal proteinuria in urin**

if these criterias are fullfil then continant diversion can be tolerated well by patients.

❖ **Basic principles of orthotopic bladder:**

1. must have adequate capacity
2. low storage pressure
3. normal patent urethra with external spincture

Contra indications for orthotropic bladder:

1. positive urethral margin
2. involment of bladder neck in female
3. vaginal vault involvement
4. compromised renal function
5. recurrent urethral stricture

Advance bladder carcinoma is not a contra indication for orthotropic bladder.

Prior radio therapy and prior RARP is not absolute contra indication.

No evidances are there to suggest that orthotropic bladder leads to progressive renal function detoriation in patient with normal upper tract.

❖ **Advantages and disadvantages of using various segments of G.I. tract:**

• **Ileum:**

Advantages:

1. outer circular muscle layer has greater distensibility
2. large capacity good compliance
3. mysentry allows proper placement into pelvis
4. low filling pressure

Disadvantages:

1. can lead to short bowel syndrome
2. deficiency of vitb12, vit B and D
3. cant be used in patients with prior resection of ileum
4. more mucous production

• **Stomach:**

Advantages:

1. less mucous production
2. more acidic environment less infection
3. less electrolyte imbalances
4. no risk of short bowel syndrome

Disadvantages:

1. poor compliance of bladder
2. difficult surgery
3. heamaturia dysuria syndrome

❖ **Orthotropic neobladder:**

Ileum: Camey

Hautman's pouch

Struder pouch

Koch pouch

Extramural serosal lined ureter

Colonic: MAINZ II

Le beg

Reddy pouch

❖ **Hautman pouch:** using 70 cm of ileal loop

Advantages are of large capacity and no use of staplers. Short length of ureter or dilated ureter can also be anastomosed.

High chances of retension

Modified Hautman: using 40 cm of ileal loop only.

❖ **Studer pouch:** using 55 -56 cm length of ureter.

Long afferent isoperistalsis ileal segment is created to prevent reflux.

It is simple and easy to creat.

Post neobladder day time continance is gain within 6 to 12 months but night time continance is delayed by 24 months because

1. **decrease spincter tone by night**
2. **loss of neurological feed back**
3. **physiological nocturnal dieresis**

Hyper continance (retension) risk factors:

1. using > 60 cm of bowel
2. ventral hernia – ventral hernia is a specific complication of neobladder. Weakness of abdominal muscles due to voiding with abdominal straining and once it is formed it leads to ineffective emptying of bladder.
3. Female patients in whome loss of vaginal vault and posterior support

No role of pharmacological treatment.

Pouch rupture: emmergency condition requires urgent exploration and repair. It is diagnosed with CT cystogram.

Advantages of detubularisation of bowel:

1. **Increase the volume of pouch. Volume in relation to radius**
2. **Lower the pressure. Pressure is inversely related to radius**
3. **Good compliance**
4. **Contractibility of bowel segment is decrease.**

❖ **Follow up protocols for neo bladder:**

Initially to rule out early complications

Upto 3 years to rule out recurrence

Late after 3 years to rule out late complications of neobladder like stone, renal impairment

For 1st year every 3 monthly and then every 6 monthly upto 3 years:

History examination

- CBC
- RFT
- Metabolic profile.
- Every yearly cytology and Vit B12 level
- Radiological investigation depends upon the T stage of bladder tumor.

Pre requisite for ureterosigmoidostomy:

1. Rectal holding capacity >200cc
2. Normal sigmoidoscopy
3. Normal RFT

C/I for ureterosigmoidostomy:

1. Large dilated ureter
2. Bowel diverticulum
3. Malignancy of bowel
4. Prior RT

Precautions in ureterosigmoidostomy patients:

1. Empty rectum every 2 hourly
 2. Routine night time catheter into rectum
 3. Give megnasium
 4. Give potassium supplements along with bicarbonate
- } to decrease metabolic acidosis.

Various continence mechanism for continence pouch:

1. Mitrofanoff's
2. Intussusepted nipple valve
3. Hydraulic valve
4. Imbricated ileum

Significant contraction of loop: >40cm of water at <200cc capacity.
Seen in 0% in case of detubularised ileum and 105 in detubularised colon.

(Complications of bowel segments using in urinary tract is very wide topic and well described in Campbell. So please go through it.)

Q: what is Vinflunine?

A: novel anti –tubular agent
Vincristine → Vinblastin → Vinflunine

Q: what is HD-MVAC?

A: same dose MVAC but more frequent MVAC cycles

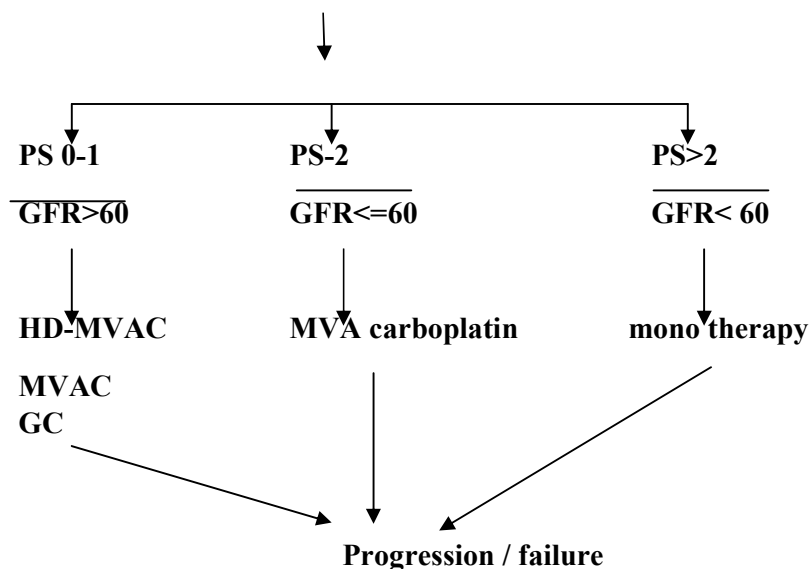
Q: how will you control toxicity of MVAC?

A: assure GFR > 60
Supplement with GM – CSF



Q: how will you treat metastatic TCC bladder?

A: Evaluate Pt – TNM, - sr. Creat, GFR, - ECOG status



After progression or failure of metastatic tumor:

Performance status

RFT

Timing of relapse are the deciding factors for further management.

If PS 0-1 and relapse within 6 months : vinflunine

If PS is 0-1 and relapse after 6 months: if poor RFT – give vinflunine

If normal RFT – re administration of primary chemo

If PS -2 : give only palliative care.

Q: what immune therapeutic agents can we given for ca bladder?

A:

Bevacizumab	Sorafenib
Cetuximab	sunitinib
Trastuzumab	Axitinib

Q: what are the novel agents for Bladder TCC?

A: NOVEL TCC agents

- N-- Nano-Paclitaxel
- O--oxiplatin
- V--Vinflunine
- E--Estrogen modulator – Tamoxifen
- L--Larotaxel
- T--Trastuzumab
- C--Cetuximab
- C--Cytokine inhibitors.



Q: how will you fl/up the pt after radical cystectomy for T₂ disease?

A:

T₂ → PC₃ @ 4 mo x 1 yr
 @ 6mo x next 2 yr
 @ 12 mo x 5 yr } + yrly CECT for 2 yrs.

PC₃ P – Physical examination

C- Common blood parameters → Hb, CBC, RFT, LFT, Ca⁺⁺

C – Cytology

C – CXR.

Q: what is Trimodality Protocol?

A: TURBT → 3 cycles MVAC → 40 Gray XBRT + 2 cycles cisplatin

Check response, if good then give additional 25 gray XBRT + cisplatin.

Q: What is the difference b/w palliation v/s salvage surgery?

A: Palliative: Pain –relief (without cure of underlying cause)

Salvage: saving some sinking ship (with definitive cure of cause)



USI- MOCK EXAM CASES
CA BLADDER

55 year Male gross Hematuria + amorphous clots since 5 days, h/o LUTS + dysuria
No h/o loss of wt,
no other +ve of cough, jaundice, bone pain.
TURBT done at local centre: high grade bladder TCC (TURBT)
Ex – smoker 30 yrs

Now also having complains of gross hematuria since 5 days
On exam – NAD

DRE:

- Hard mobile mass felt on left side.& separate from prostate
- Not possible to get above the mass
- Rectal mucosa freely mobile.

Q: based on history what can be T-stage?

A: as it is palpable on DRE; But mobile it should be anywhere around T₂, T₃

If mobile = T_{3b}

If fixed = T₄

Q: what is the implication of persistent hematuria in this case?

A: Residual disease (even after attempted TURBT)

Q: what will you do next?

A: USG done... lateral wall bladder mass 4x4 cm, Left kidney HUN +, Rt kidney normal
RFTs – normal
CBC, LFTs

Q: why do you want to do USG first?

A: cheap /available / handy

Lot of information

- Mass
- HUN
- Other kidney

Q: What is the implication of HUN?

A:

- Tumour near ureteric orifice
- HUN suggests Muscle invasive disease
- Rarely NMIBC causes HUN

CECT findings:

- bladder mass 4x4 cm
- Extension in perivesical space
- No lymphadenopathy

Q: where will you see for lymphadenopathy in CECT pelvis?

A: in axial cuts

- Along the external and internal iliac vessels
- Obturator fossa –against the head of femur

Q: what next will you do?

A: CXR-PA

Q: How will now proceed for this case?

A: As the mass is extending perivesical involvement ideal Mx is neo adjuvant chemo + cystectomy
And doing a re-TURBT

Q: why do you want to do Re – do TURBT?

A: B'coz this perivesical infiltration on CECT may be artifact due to previous TURBT

Also control of ongoing bleeding can be achieved by TURBT

Inadequate information in 1st or TURBT, T –staging not known, Mandatorily → muscle invasion must be documented before radical cystectomy

TURBT findings

- Mass palpable on bimanual exam, freely mobile
- Left U.O not seen
- Resection done
- Mass still palpable after TURBT.

Q: what is other inference from TURBT?

A: b'coz mass is still palpable after resection, I think it is T_{3B}.

Q: what is the biopsy report?

A: TCC malignancy - muscle seen involved, sarcomatoid changes present

Q: what is the implication of sarcomatoid changes?

A:

Sarcomatoid changes mean tumour has Epitheloid (carcinoma) elements & sarcomatoid (Mesenchymal) elements in the same cancer.

Poor prognosis

Usually sarcomatoid changes are not related to smoking

These are very highly aggressive tumour.

Major Sarcomatoid elements are

- Leiomyosarcoma & Rhabdomyosarcoma.
- Angio sarcoma
- Osteo sarcoma
- Undifferentiated

Q: what is the goal of management in sarcomatoid changes?

A: surgery first,

Premium on negative margins (high local recurrence if margin are not cleared)

Supplement surgery with chemotherapy doxorubicin / cisplatin.

Q: what are the most common sites of mets?

A: Lung > Bone > liver

Q: what will you do in this case?

A: As there are sarcomatoid changes I would do straight away Radical cystectomy.

Q: if this tumour would have been pure TCC then what is Mx?

A: neo adjuvant chemo + radical cystectomy

Q: what is the status of chemo / chemo-radiation for sarcomatoid changes?

A: due to very small (1%) incidence

We do not have standard guidelines

If chemo → choose doxorubicin / cisplatin or gemcitabine /cisplatin.

This pt was treated with neo adj gemcitabine +cisplatin, The repeat CT shows complete response.

Q: will you still do radical Cystectomy now, when the tumour has completely resolved (T₀)?

A: yes, neoadjuvant chemo should always be followed by radical cystectomy even if there is complete tumour response.

Q: what are the adv. of neo adjuvant chemotherapy for TCC bladder?

A: Advantages

- 5% survival benefit
- Better tolerated
- Able to receive full cycles
- Primary tumour evaluated for response which has prognostic significance

Dis adv:

- Delays surgery
- Only 5% benefit

Q: what are the contra-indn for chemotherapy?

A:

- GFR < 60 ml/min
- Creat > 2 mg /dl
- Ejection fraction < 45%
- Karnofsky performance score < 70
- Evidence of hearing loss
- Peripheral neuropathy > grade 1.

Q: when will you do Sx after neo adj chemo?

A: after 3 wks of last cycle

MVAC -3 cycles or 3 cycles GC

Q: when will you start adjuvant chemo after Sx?

A: within 90 days (usually 6-8 wks after Sx)

MVAC four cycles

Q: what are the famous neo adj chemotherapy trials?

A: Nordic I, Nordic II, SWOG

Q: what is the meta-analysis statement for neo adj chemo?

A: 5 yr overall survival benefit of 5%

Q: how will you fl/up superficial NMIBC?

A:

Low risk= T_aG_1

- Cystoscopy @ 3mo following initial resection
- Annually beginning 9 mo after initial Yearly x 5 yr
- cytology , \pm tumour markers, + usg if hematuria
- Consider cessation at 5 or more yr

Intermediate Risk Recurrent T_aG_2 , T_aG_1 , Multiple T_aG_1 .

Check cystoscopy

- @ 3 mo x 2yr
- @ 6 mo x next 2 yr
- @ 12 mo x for next 5 yr

Restart clock if tumour recurs

USG if hematuria

Cytology every time

High Risk -- T_1G_3 , CIS, T_aG_3

Check cystoscopy

- @ 3 mo x 2 yr
- @ 6 mo x 2 yr
- Annually lifelong

USG ,cytology or tumour markers on each visit

CECT every 2 years and then prolong the interval

Q: what is the latest neo adj trial?

A: INT – 0080 , **Randomized Phase III Trial of Neoadjuvant MVAC + Cystectomy Versus Cystectomy Alone in Patients With Locally Advanced Bladder Cancer**

Results:

- There was no difference in the post-cystectomy complication rates
- 5 yr overall survival was 57% v/s 42% favoring the MVAC arm
- Patients with a pathologic complete response had an overall survival of 85% at 5 years

Authors' Conclusions

- MVAC is safe prior to radical cystectomy, although toxicity can be moderately severe
- MVAC does not decrease the chances of a patient having a radical cystectomy
- This is the first randomized trial to show both a clinically and statistically significant advantage to the addition of neoadjuvant chemotherapy in locally advanced bladder cancer
- Neoadjuvant MVAC can be offered as a treatment option

Q: who made MVAC Regimen?

A: MSKCC

Q: what is the most common side effect of cisplatin ?

A:

1. Nephrotoxicity
2. Vomiting

Q: what can you give to prevent & treat vomiting?

A: Antiemetic → emeset (ondansetron)



Aprepitant (brand name: Emend) is an [antiemetic](#) chemical compound that belongs to a class of drugs called [substance P](#) antagonists (SPA). It mediates its effect by blocking the [neurokinin 1](#) (NK₁) [receptor](#).

Q: what % of pts progress from NMI → MI ?

A: 20% even after Px

Q: what is the cause of death in Muscle Invasive Tumour (MIBC)?

A: distant mets

Q: after Rad Cx or Rad Px in what time mets appear?

A: 2 year without systematic chemo

→ 5 yr with systemic chemo

Q: what para-neoplastic syndromes can occur in P-NET?

A:

- ACTH
- Hypercalcemia
- Hypophosphatemia
- HTN

Q: how will you treat P-Net?

A: Neo Adj Chemo (Cisplatin /Etoposide) → Surgery → adj chemotherapy

LOWER TRACT- CYSTOSCOPY SET

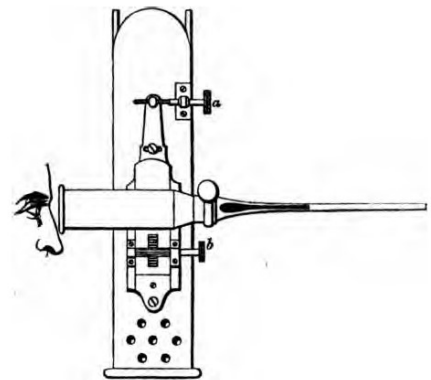
Q: what is cysto-uretheroscopy?

A: Directly visualizing the anterior urethra, posterior urethra, prostate & bladder.

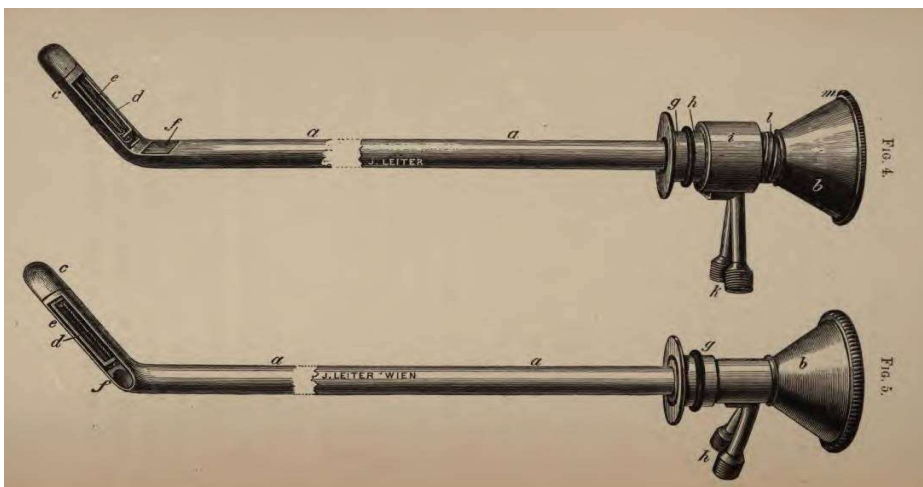
Q: describe the history of cystoscope development?

A: The first attempt at cystoscopy was in **1807 by Philipp Bozzini of Frankfurt**. His Lichtleiter ("light conductor") consisted of a thin metal tube that allowed reflected candle light to shine into an orifice, such as the urethra. He presented it to the Academy of Medicine in Vienna. Although not really very usable, it was a start and, for the next few years, future attempts at creating a cystoscope were made along similar lines.

Antonin Desormeaux used an alcohol lamp for his light source in 1853. Light was reflected in by a concave mirror and Desormeaux's cystoscope was usable. He reported seeing stones and ureteroceles. This was improved by Francis in 1865 with a rack and pinion, adjustable lens (pictured diagrammatically, right).



Max Nitze realized, however, that the light source had to be in the bladder. He used a heated platinum wire and had an instrument made by Diecke in Dresden in 1877. **It was too hot, needed water cooling and kept burning out.** A better model (pictured left) was made for Nitze by Leiter, an instrument maker in Vienna in 1879. Although much better, it was still too hot.

"Cold" Light Sources

The problem of the hot light source was solved in 1880 by Edison's invention of the incandescent light bulb. This was first used in a cystoscope by David Newman of Glasgow, but, like Kelly's, could only be used in women.

In 1899, F Tilden Brown of Baltimore used two different lens systems to visualize the bladder; they could be swapped over using the same sheath to prevent re-instrumentation of the urethra. Leo Buerger expanded on this idea of passing different instruments down the same outer sheath and the Brown-Buerger cystoscope (pictured right) introduced in 1907,



became a standard instrument for years. Fibre-Optic Light Sources during the 1950's and 60's, Harold Hopkins developed fibre-optic light transmission and the rod lens. The German instrument maker Karl Storz combined these ideas leading the way with the modern cystoscope; this was presented at the SIU in Munich in 1967.



Max Nitze 1848 – 1906

The Nitze cystoscope was presented to the National Medical College in Dresden in 1877, when Nitze was 28 years old. It is credited with being the first truly functional cystoscope and this Original design remained essentially constant for almost a century . The instrument consisted of an inner telescope, which contained the lamp and the prism for observation, and an outer sheath, which had an irrigating channel and an operating channel, through which a retractable wire snare could be attached. Nitze's cystoscope was so popular that in 1910 Christian Jacobaeus used it to perform the first thorascopy and laparoscopy

The cystoscope had seen few changes in design since Nitze's assembly in 1879. The initial 'Lichtleiter' scope by Bozzini in 1806 was illuminated by a beeswax candle on a stand .Nitze and Leiter used a hot platinum wire which required water-cooling, making the whole apparatus rather bulky. The next few years saw Edison's incandescent light bulb developed further by Newman from Glasgow who placed the bulb at the distal end of the scope . **The main problems then were constant blowing of the bulbs, and a suboptimal image quality. Despite further development of cystoscopes in the USA, image transmission remained poor in the late 1940s until Hopkins's input.**

The traditional cystoscope consisted of a cylindrical tube of air with thin glass lenses. According to Hopkins's research student, it was initially by accident that Hopkins developed thicker glass lenses for ease of mounting and lens stability, and instantly realized the difference in image transmission. He then meticulously worked out the physics, and came up with the **glass rod-lens system** 18 months later in which the tube had glass rods with thin air lenses. Not only did this improve the image quality and light transmission, it also made the lens mounting and holding much easier. **As glass is a better conductor of light than air, and there were fewer glass/air interfaces in the Hopkins system, light scatter was reduced.** With the glass-rod system, the internal mounts, which reduced the aperture of the previous thin glass lens, were no longer necessary, leading to a larger aperture, with a brighter, clearer image. **Multilayer anti-reflective coating further improved the system so that total light transmission was increased 80-fold.** Hopkins and Gow showed the first photographs of the Hopkins system at the **Société Internationale d'Urologie (SIU) meeting in Rio de Janeiro in 1961, using a two-filament bulb for illumination.**

Hopkins approached all the cystoscope manufacturers in the UK with his idea. Sadly, once again British and American investors failed to see the potential gain of this ingenious invention.

THE KARL STORZ CONNECTION

In 1965, Hopkins lectured in Cologne, Germany where he presented his work and Gow's photographs. The response was overwhelming, with many requests for his instrument. He had to disappoint the audience saying no one had manufactured it. Hopkins returned to England, and received a telephone call in faltering English from Tuttlingen, Germany. Hopkins replied in fluent German, much to Karl Storz's relief. Storz ran a small instrument company then, and was told of Hopkins's invention by George Berci, a renowned general surgeon and friend of Storz who had seen Hopkins's prototype earlier and was very impressed by it. Within a week, Storz came to meet Hopkins in England and the two men agreed to work together. A contract was made only a few days later. Storz added his own brilliant application to the rod lens: he incorporated flexible fibre-optics used previously for image and light transmission. They presented their winning combination of Hopkins's 'rod lens' and Storz's 'cold light' at the SIU meeting in Munich in 1967, and instantly swept the field

Q: what are the components of cystoscopy set?

A:

- Cystoscope sheath
- Blind Obturator (optional)
- Bridge
- Alberran bridge (optional)
- Telescope

Q: Describe the Cystoscope sheath?

A:

- cystoscopy sheath is made up of **surgical stainless steel**.
The most common "surgical steels" are **austenitic 316 stainless** and **martensitic 440 and 420** stainless steels. Stainless steel-316, also referred to as "**Marine Grade Stainless Steel**", is chromium, nickel, molybdenum alloy of steel that exhibits relatively good strength and corrosion resistance. Surgical steel resists staining, but it also resists corrosion, which is critical in the operating room.
- **Length → 23cm working length with 1 cm markings.**
- **All various size of sheaths have same length.**
- Parts of cystoscopy sheaths-tip, shaft and base

❖ **Tip**- tip is the distal end of cystoscopy sheath

- The most distal end (nose) of tip is raised up and has a smooth mould/ mount on the upper side. This smooth mount helps in atraumatic insertion of the instrument, especially with the 30° scope, in which the operator inadvertently raises the tip of instrument so as to keep the urethral lumen in centre.
- Thus every time a cystoscopy is done using 30°, the mount brushes against the upper urethral wall. The mount not only **prevents urethral wall abrasion** but **also lifts the upper urethral wall up and shows the urethral passage.**



- The lower lip of the tip is half cut and allows the telescope to project out along with the accessory instrument /RGC catheter(single compartment).
 - **The sheath in cross dimension not completely round it is of oval shape. So FR dimension ideally doesn't fit for the sheath.**
 - **17FR sheath has small beak of 2cm while rest all other sheath has beake of 2.5 cm.**
- **How to do urethroscopy in female?**
 - **Do scopy during withdrawing the scope from bladder**
 - **Use 17FR sheath as having small beak.**
 - **Special nickel adaptors are available to cover beak otherwise irrigation will lost from sheath.**

❖ **Shaft**

- Shaft of the cystoscopy sheath extends from tip to the 'glans-stop.'
- **Glans-stop** is the circular disc mounted across the shaft. **It stops the instrument at glans level and thus preventing injury to the glans during procedure. Glans-stop is colour coded for the size of the sheath.**



- There are **1 cm marking** over the shaft. This marking is for **measuring prostatic urethra length** or **urethral stricture length**. The length is measured while withdrawing the scope and counting the markings that come out of the glans tip during scope withdrawal.
- **Distal 10 cm** (towards tip) may not have markings as this part always remain inside during cystoscopy



Colour coding of cystoscopy sheaths as per the colour of 'Glans –stop'

Sheath Colour

Sheath	Colour
16	Navy Blue
17	Yellow
19	Green
21	Red
22	Blue
25	White

Cystoscope Sheath	Catheter Capacities Albarran Working Element	Catheter Capacities Telescope Bridge 2-Channels	Catheter Capacities Telescope Bridge 1-Channel	Colour Code
17 Charr.	1 x 5 Charr.	1 x 5 Charr.	1 x 5 Charr.	Yellow
	2 x 4 Charr.	2 x 4 Charr.		
19 Charr.	1 x 6 Charr.	2 x 5 Charr.	1 x 6 Charr.	Green
	2 x 4 Charr.	1 x 6 Charr.		
21 Charr.	1 x 7 Charr.	2 x 6 Charr.	1 x 7 Charr.	Red
	2 x 5 Charr.	1 x 7 Charr.		
23 Charr.	1 x 9 Charr.	1 x 10 Charr.	1 x 10 Charr.	Blue
	2 x 6 Charr.	2 x 7 Charr.		
25 Charr.	1 x 12 Charr.	1 x 12 Charr.	1 x 12 Charr.	White
	2 x 8 Charr.	2 x 8 Charr.		

- If simple bridge is applied then passable assesories size increase by 1 FR then what is written on sheath. This numbers fits exactly when we are using albran's bridge.

❖ **Base:**

- Base of the cystoscopy sheath has a body through which the telescope and instruments pass.
- **Size of the sheath is written over the base along with the size of instruments that can pass through the sheath when the telescope is in place.** Say for example the 19 fch sheath can take one accessory/RGC of 6 fch or two accessory/RGCs of 5 fch each.
- There are two side channels for **water inflow and outflow with Luer locks.**
- Lastly there is groove for locking in the bridge.
- There is a '0' written over proximal end to align with '0' of bridge.



Q: What are the advantages of rigid sheath?

A:

- Better optics
- Large Working channel
- Better water flow , Better visualization
- Ease of Manipulation & Stabilization

Q: What are the markings on cystoscope sheath?

A: 1cm graduations (for measurement)

Distal 10cm (towards tip, there is no markings)

Q: How many channel does cystoscope sheath has?

A: Only one common single shaft channel.

- ❖ Extra long length cystoscope sheath also available with 29cm of length. They usually come in 22FR diameter and in blue glass stop colour.
- ❖ Continuous flow LASER cystoscope sheath is also available. They are of 21 FR and allow 8FR accessory to pass.
- ❖ **Obturator of sheath:**
 - **26cm of length and specific for given sheath.**
 - **They snugly fits into sheath and made meatus tip smooth.**

Cystoscope obturator

Shape of cystoscope beak

Groove for irrigation.

Length similar to sheath

VIU sheath obturator

Rounded tip

No groove

project outside the sheath

BRIDGE

Full name: Adapter Bridge - single side channel,
 - Double side channel



- Bridge has a distal end (male end) which gets inserted into the cystoscope sheath.
- The distal end (male end) has a '0' written over it, it should be aligned with '0' written over cystoscopy sheath to allow proper alignment with cystoscopy sheath
- This distal end has a rotating type locking system with teeth. The teeth are aligned with groove of cystoscopy sheath and then rotated clockwise to lock in.
- Opening the lock needs anticlockwise rotation. There is a small knob to rotate the lock clockwise or anti clockwise
- **Two limbs: Straight limb → for telescope**
 Angulated limb → for accessory instrumentation
- The straight limb also has a rotating lock system (but female type) to lock the telescope into it.
- This is also rotated clockwise to lock-in. Opening the lock needs anticlockwise rotation.
- ❖ **Why bridge is not incorporated in sheath or in other way advantages of detachable seath bridge?**
 - Bladder can be emptied efficiently
 - Passage of larger size catheter possible after detaching the bridge.
 - Helps attachments of elik's evacuator.

- ❖ Bridge and telescope are universal they can be attached to any size of sheath.
- ❖ Universal bridge is 4 cm in length.
- ❖ Long bridge is also available for VIU sheath.

❖ ALBARRAN DEFLECTOR BRIDGE

Q: what is deflector bridge known as?

A:

- Albarran deflector bridge
- Deflects the R.G.C catheter downwards
- One straight channel for telescope
- Two angled side channels (inferiorly)
- Two rotator levels (one on each side)
- **For difficult cannulization of ureteric orifice. It is imperative to use a 70° telescope with Alberran bridge.**

Albarran Bridge is suitable for accurate articulation of flexible devices and functions on deflecting mechanism while providing for insertion of stone baskets, catheters, biopsy forceps as well as other process support accessories. Coming with **thumb wheel or spring deflection mechanism**, these are color coded and ensure minimal angulation of accessory ports. These also allow for rapid assembly/disassembly as well as also provide superior alignment of components with ports designed to accommodate larger accessories.

Features:

- For achieving accurate articulation of flexible devices
- Based on **deflecting mechanism**
- 1 working channel with provision of inserting stone baskets, biopsy forceps, catheters and other accessories
- **Precision wheel mechanism** to control deflector lid
- Allows superior positioning of accessories
- Quick locking mechanism with color coded finish
- Allows quick assembly/disassembly
- **With deflecting mechanism With 2 working channels, 1 x 12 Charr. and 1 x 9 Charr. with ratchet**



Albarran Bridge



Proximal end of Albarran bridge



Distal tip Albarran Bridge

❖ TELESCOPES

Q: Who invented cystoscope?

A: Max Nitze (German)

Q: Describe the Telescope?

A:

1. Length = 30cm
2. Width = 4 mm
3. Parts-Objective lens , Eye piece lens, light pillar,

0°-Green → for uretheroscopy

30° - Red → for Base & Antero lateral aspect of Bladder

70° - Yellow → for Bladder dome

120°-white → for anterior Bladder neck

4. Eyepiece of Telescope is of Bakelite
5. Light post / pillar is for attachment of light cable



Q: who discovered rod lens system?

A: Hopkins

- Rod lens system contains **glass rods separated by air columns**
- Long rods of grounded polished glasses
- More the number of glass rods better magnified will be the image and better image quality

Q: what is Hopkins I & Hopkins II rod lens system?

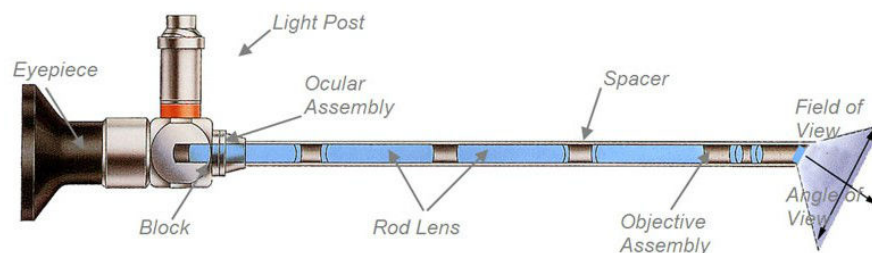
A: Hopkins - I, older version, more air spaces, less glass columns

Hopkins – II, new version, less air spaces, more glass columns

Long rods of grounded polished glasses

❖ Advantages:

1. Improvement in viewing angle from 90° in Hopkins I, to 120° in Hopkins II
2. Better visualization, more clarity
3. More light
4. Decrease in profile of telescope shaft
5. Hopkins II system is autoclavable
6. Increase refractory index
7. Image resolution is more and better.



Q: What are the parts of telescope?

A: Tip: it is the distal end and contains two compartments –

- 1) outer /upper compartment for light transmission 2) inner /lower compartment for image transmission
- image transmission compartment contains a prism for deflecting the angle of view ranging from 0° to 120° .

- **shaft** : contains the glass rod system and light transmission. Rode lense are glued by specific adhesive cement which made scope water resistant.
- **body** :
ocular assembly
 'light post' is attached to the body
 Colour coding is there at the light post for depicting various degrees of angle of deflection.
 - 0⁰-Green
 - 30⁰ - Red
 - 70⁰ – Yellow
 - 120⁰-white
- **eye piece** :
 Made up of Bakelite to prevent current transmission / conduction to operators eye as previously it was used without camera. Direct from eye.
 If scope is autoclavable then it is written just ahead of eye piece
 Attaches to camera head.

Q: what is special about 120° telescope?

A:

- **distal end is closed /blind**
- **Light hole opens just proximal to the tip but on inferior surface**
- Objective lens is just proximal to light hole and is wedge shaped opening with lens appearing to be looking in backward direction
- Light post colour code is white



Q: what are the different types of lithotomy position?

A:

- **Low lithotomy** position 30^0 hip flexion
- **Standard lithotomy** 70^0 hip flexion
- **High lithotomy** $>90^0$ hip flexion
- **Extended lithotomy** $>120^0$ hip flexion

Q: what are the components of lithotomy position?

A: Lithotomy position has '3' components

- ❖ Hip flexion
- Hip abduction – Wide spread apart, - std
- Knee flexion – parallel to the ground (std), 90^0 to femur

❖ OTIS MAURMEYER URETHROTOME



History:

- **Fessenden Nott Otis** 1825 - 1900 was an American urologist who calibrated the male urethra, confirming it was 32Ch gauge, thus allowing larger instruments to be developed. The Otis urethrotome is, basically, his "**urethrometer**" with a **dorsal blade**.
- used as a **torture instrument** for looking into the bladders of captivate female spies to search for hidden messages /articles in bladder during world war II
- Later on **modified by Maurmeyer** by making the dilating shaft a double arm parallel opening system and dismountable knob for attachment of filliform dilators.

Name: Otis Maurmeyer uretherotome

Type-**Parallel expanding blade type**

Components:

1. Distal knob / screw for filliform dilators
2. Parallel expanding Dilating shaft with groove for knife
3. Proximal circular disk & gradations
4. Proximal knob for expansion of blade
5. Knife blade to make a uretherotomy cut

Tip:

- tip of the instrument is a conical screw cap which allows smooth entry into the meatus
- If the cap is unscrewed underneath is a screw (male type) on which can be attached female filliform
- Once the female filliform reaches the bladder the Otis dilator can be replaced with male filliform followers and serial dilatation can be done if needed.



Shaft :

- Shaft is a parallel expanding blade system
- The two dilating arms remain parallel to each other leading to uniform stretching of urethral mucosa
- **Minimum 14 fch** lumen is needed to insert the shaft even in completely closed position
- Dilating shaft blades can be opened by rotating the proximal most screw in a clockwise direction
- Amount of dilation can be judged by looking at the circular graduated disc indicator
- Maximum dilatation can be achieved upto **45 fch**.
- Once the desired dilatation is done the knife blade can be pulled out in a single smooth pull which makes a **urethrotomy cut at 12 o'clock** which **only cuts mucosa**.
- Dilating shaft is then partially closed and the whole assembly is withdrawn out.
- **If the shaft is completely closed back there are high chances of entrapment of urethral mucosa between the arms of dilating shaft ,so only partial close back before withdrawing the instrument.**

Knife blade:

There is a small triangular shaped knife blade with a long shaft and proximal handle

Aligning the knife in its groove is very important and always asked in exam

- Hold the instrument in left hand between four fingers and thenar eminence. keep the left thumb free.
- Keep the tip of knife blade at the proximal end of the knife groove, align the shaft of knife blade into the Small wedge knob given at the centre of the graduated disc and place your left thumb over the neck of knife blade shaft and support the knife alignment.
- Gently push the knife blade making it slide under your left thumb till the whole knife is pushed in .
- avoid buckling of the knife shaft during push
- **The triangular knife will completely disappear into the shaft groove as it reaches the distal end**
- now open the dilator shaft by rotating the proximal screw
- See the graduated dial moving from 15 fch mark onwards.
- dilate as needed for TURP before passing resectoscope dilate atleast 5FR then the size of sheath. so dilate atleast upto 30FR.
- pull out the knife back in a swift action
- partially close the arms of dilating shaft
- withdraw the whole assembly

Q: what is the working length?

A: 11 inches

Q: what are the gradations on the disc?

A: from 15- to – 45 Fch



Q: what are the shapes of knife blade?

A: 3 interchangeable knives

Triangle is the most common shape. The blade should not be seen completely inserted but slowly appears as it is pulled back

Q: what are the disadvantages of Otis urethrotome?

A:

- blind procedure
- Before using Otis dilator it is necessary to do a prior uretheroscopy
- Bleeding
- Needs an assistant to hold the penis pulled up over the shaft of instrument
- Otis dilator definitely needs an assistant in male patients as both the hands of surgeon are busy handling Otis dilator –left hand holds the instrument and right hand moves the dilating screw or pulls out the knife.

Q: what are the uses of Otis dilator?

A: female:

- Urethral stretching
- Urethral stenosis

Male:

- Before TURP

Q: what is the function of distal screw tip?

A: attaches to filliform and aids in subsequent dilation by followers

Q: what is the other shape available in Otis dilator?

A: curved Otis dilator



❖ VIU-SET

Q: what is the name of VIU set?

A: Sachse's optical urethrotome



Q: What are the components of VIU set?

A:

- Obturator – (for inserting in meatus; otherwise sharp edges erode the urethra)
- Working element → always **passive type of working element. Never active as in active type blade will remain out and may damage urethra.**
- Blade → Straight knife, hook, half moon, serrated half moon
- **Telescope – 0° forward viewing** as we have to see only straight view.
- Half moon sheath

Q: how will you identify VIU sheath against the cystoscopic sheath?

A: Tip

- **The tip of VIU sheath is abruptly straight cut with sharp margins**
- **There is no mount at the upper lip of VIU sheath**

Shaft

- **Shaft is oval /oblong in cross section**

Base /proximal end

- **An angulated side channel is present in VIU sheath in addition to the two side water channels**
- **For insertion of guide wire.**
- **It is always on the left side for keeping in mind with majority of right handed surgens.**

Q: Describe the VIU sheath?

A:

- **Sheath is 21 Fch 20cm length and 5 FR assesory channle**
- **Oval shaped / Oblong shaped in cross section**
- **Proximal angulated side channel can take max, 5 Fch RGC catheter.**
- **VIU sheath has centimeter gradations throughout on its length.**

Q: when will you use obturator?

A; always (for entering in the meatus) **otherwise its sharp tip can injure the urethra.**

- VIU obturator is a blind obturator
- After negotiating the meatus the obturator is removed



Blind obturator of VIU sheath

Q: describe the blades of VIU set?

A: most commonly used is a **straight knife**

- **Straight blade-** used for soft strictures with minimal fibrosis
 - Blade has to go across the stricture and then cut while returning back in passive motion
 - Chances of breaking of blade are there in cases of tough strictures.
- **Half moon blade** - Used for tough strictures
 - Can cut while actively going in as well as in returning position.
 - Mostly for BN stenosis.
 - Never use for bulbar urethral stricture as for its opening more space is needed which is not available in bulbar urethra can lead to injury.
- **Serrated half moon** –used for extra tough/fibrosed tissue

Q: How will you choose correct passage out of the 3-4 false passages ?

A: Inject methylene blue through SPC/ needle spc puncture

Q: what are the complications of VIU?

A:

- Bleeding
- Septicemia
- False passage
- Urethral mucosa erosion early
- Meatal injury
- Breaking of Sachse's blade
- Sphincter injury
- Epididymo-Orchitis, urinary retention, scrotal abscess.

Late complication:

- re-stricture
- Erectile dysfunction

Q: How will you control bleeding after VIU?

A: In the order the following can be done

- Deploy large Foleys
- Compression bandage
- Sylvare's Manoeuvre → (Telescoping penile urethra and putting a gauze piece tie ahead for maintenance).
- Bugbee Cauterization
- Open & control bleeding

Q: where will you make cut's while doing VIU

A: Usually 12' o clock

If stricture is tough or spongiositis is deep then multiple radial cuts can be made

Q: what will you do if blade breaks inside?

A: Take the blade out (don't leave it in). Try to pass nephroscope and bring the blade out with forceps. If not possible then open and remove it.

Q: how is the working element?

A: Passive – (Nesbit's)

Q: which fluid do you use of VIU?

A: Saline

Q: What is full name of VIU?

A: Direct vision – internal Urethrotomy (DVIU)

Q: What is the problem with 12 O 'clock cut?

A: deep cut can penetrate through the corpus spongiosum (which is thinnest @ 12'o clock) into the intercrural space that may lead to bleeding & Erectile dysfunction later on.

Q: For how long to keep catheter?

A: 3-4 days

Q: what is the success rate of DVIU?

A: 33-35% (depends upon stricture length / fibrosis /previous VIU attempts).

Q; describe the half moon sheath of VIU?

A: half moon sheath is meant for **deploying Foleys catheter after making the way through stricture**

- Half moon sheath is **pre loaded over the VIU sheath** (actually **half-moon sheath is on the lower side of VIU sheath**)
- Once VIU is complete the VIU sheath is detached from the half-moon sheath, leaving the half-moon inside
- Foleys catheter is then deployed through half-moon sheath and sheath removed
 - Storz half-moon can take 16 Fch Foleys max (Storz Sixteen)
 - Wolf half-moon can take → 14 Fch Foleys max (wolF-Fourteen)

Q: What is the technical name of VIU & instrument?

A: Direct Vision – Internal Urethrotomy DVIU

Instrument- Sacche's urethrotome/ 21 Fch / with side channel

Q: What is the principle of VIU?

A:

Internal Urethrotomy

- Internal urethrotomy (surgical incision into the urethra for relief of stricture) encompasses all methods of transurethral incision or ablation to open a stricture.
- The goal of cutting a stricture is to have epithelial regrowth before scar recurs in the same area. At best, the result of urethrotomy is to create a larger caliber stricture that does not obstruct urination.
- Urethrotomy is potentially curative for short strictures (less than 1 cm) that have minimal spongiofibrosis.
- After each successive urethrotomy, there is a period of fleeting good urinary flow, followed by a worsened degree of spongiofibrosis and lingering stricture. There are also reports of lumen (cavity) obliteration, as well as hemorrhage (heavy bleeding), sepsis (a serious, body-wide reaction to infection), incontinence, erectile dysfunction, glans numbness and abnormal erection caused by disease rather than sexual desire.
- In the short-term (less than 6 months), success rates are 70 to 80 percent. After one year, however, recurrence rates approach 50 to 60 percent and by five years, recurrence falls in the range of 74 to 86 percent (depending on stricture length and degree of spongiofibrosis).
- Attempts to improve the mediocre long-term results of internal urethrotomy have been made with laser urethrotomy. Contact mode Nd:YAG lasers have been used to “chisel” out the scar. However, results are not superior to standard techniques.

Q: what is the type of healing in VIU?

A: Secondary healing

Q: At what position do you incise VIU cut?

A; we do it @ 12 o'clock

Dis adv

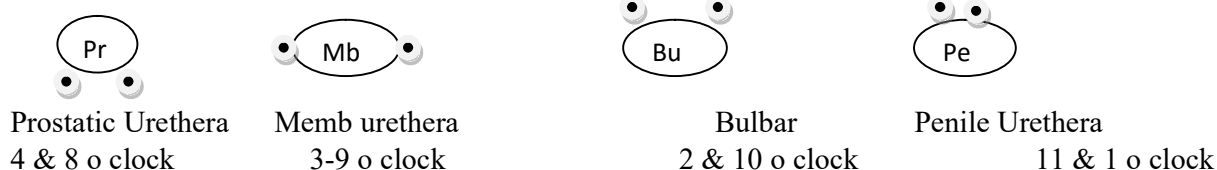
- Corpus spongiosum is thinnest in anterior bulbar urethra and even a single 12 o'clock cut may penetrate spongiosum and may enter the triangular ligament
- DVIU cuts (12 o'clock) can destroy the vascularity of future bed of BMU graft



VIU using cold knife B VIU using holmium laser. C pre VIU-cut .D post incision appearance



Q: What are the positions for cavernosal nerves w.r.t urethra?



Q: what is the ideal direction of cuts?

A: In bulbar urethra either 3 o'clock or 9 o'clock or Mercedes sign cut @ 12, 4, 8 o'clock
Mercedes Benz cut: 12,4,8 for protecting cavernosal nerves which are at 3' & 9' o'clock

Q: What is success rate of VIU?

A:

- For stricture length <1cm = 70%
- For stricture length 1-2cm = 35%
- For stricture length >2cm = 10%,
- in general 30-35% success (pansadaro et al)

Q: what is the definition of success / failure?

A; success = no recurrence till 3 yrs

Failure = Peak uroflow Q_{max} of < 15ml /sec

Q: When will you remove foleys after VIU?

A: 3-5 days

Q: Is there any role of urethral intra lesion steroids in urethral stricture Mx?

A: no

Q: What is the role of CIC after VIU?

A: Yes, Using Nelaton Catheter (= 14 FCH, K-90)

M/C protocol is once weekly for 1 yr (kajeer-guard – 1988)

Q: What is the role of repeat Urethrotomy?

A: Repeat VIU can be done if stricture recurrence is after 3 months. No role if stricture recurs within 3 months

Q: What is the famous series on VIU?

A: Pansadaro

Q: what are the complⁿ of VIU?

A:

- Bleeding
- Recurrence of stricture
- Meatal injury due to Sacche's sheath
- Breaking of knife blade



Q: How will you fl/ up?

A:

- Baseline uroflow & AUG @ post op 6 weeks
- Uroflowmetry @ 6 monthly x 2 yrs
- Alternately a flexible cystoscopy can be done as office procedure
- Readers are requested to check this answer and answer what is done in their respective institutes

Q: In what time (post operatively) a stricture can recur?

A: VIU treated stricture will recur usually in 6 months or at most within one year.

DVIU- DIRECT VISION – INTERNAL URETHROTOMY OPERATIVE PROCEDURE

Indⁿ: Short segment 1-2 cm anterior urethral stricture

C/Indⁿ:

- Long segment stricture > 2cm
- Dense fibrosis
- More than 1 attempt of previously failed VIU
- UTI
- Coagulopathy

Pre op evaluation:

- AUG+ MCU
- Urine culture- negative
- Coagulation profile normal

Preparation:

1. Local part preparation ; b'coz need for SPC need for antegrade approach
2. Antibiotics as per culture

Anaesthesia: S/A, G/A

Position: Lithotomy position

Procedure:

1. Dorsal lithotomy position
2. Painting & drapping
3. Uretheroscopy for evaluation of urethra → do not cross stricture
4. Deploy guide wire across stricture (position of guide wire can be checked with IITV if in doubt)
5. Take Sacche's urethrotome sheath i.e., blind obturator. Introduce the sheath i.e. Blind obturator to avoid injury to meatus & distal urethra.
6. Remove obturator and introduce the Sacche's blade
7. **Stabilize the penis with one (left) hand.** Advance the blade into stricture and **with an upward anterior stroking release the lever; the blade is retracted back into sheath while cutting the stricture. Cut across the stricture @ 12 o' clock**
8. Cut the **full thickness till bulbospongiosus is seen (light pink appearance)**
9. Keep advancing the sheath & cutting
10. Reach the bladder & do Cystoscopy
11. deploy zebra guidewire through the side channel of VIU sheath
12. Place 18F foley catheter over guidewire .
13. Half-moon sheath can also be used for deploying Foleys catheter. If half-moon sheath needs to be used then it is preloaded on VIU sheath before doing VIU.

Post OP:-

- Remove Foleys after 3-5 days
- Continue antibiotics for 5-7 days
- Anticholinergics may be added if needed.
- Patient is advised to do self catheterization / dilation as per the case
- Fl/up @ 3 months for uroflow.

Q: what is the self dilation protocol you use?

A: 14 F, straight catheter, once daily x 15 days and then tapered gradually

Q: What else can be used for VIU, other than cold knife?

A: Laser HO: YAG

❖ TURP SET**Q: what are the major historians of TURP?**

A:

- Edwin Beer → Caultry (underwater)
- Hampton young: cold cup for TUP
- Davis → foot switch of caultry
- Maximillian stern → cutting loop
- Mc' Carthy :- Resectoscope Reck 'n' penien type
Bakelite sheath
1st modern ressectoscope
- Iglesias ;- Passive working element
- Baum Rucker: active cutting working element



Q: what are the components of TURP set?

- Outer fenestrated sheath
- Inner sheath with Bakelite tip
- Visual obturator Schmidt's
- Working element-either active or passive
- Telescope

Q: Describe the Outer sheath & inner sheath?

A: classical /older Outer sheath –

- Water /Glycine come out (from the bladder to exterior) through outer sheath
- For outflow
- **Distal tip is fenestrated with multiple small holes that lead to water exit. Water enters the fenestrated holes and runs between the outer and inner sheath to come out finally from the outlet channel at the proximal end of outer sheath.**
- Most commonly used size is 26 fch outer sheath
- **Non rotating type** –means when the surgeon turns the resectoscope assembly 90⁰ towards right or left lateral lobes of prostate, the complete assembly turns leading to a torque on urethral wall as well as friction. This leads to higher chances of urethral stricture. **Having only outflow channel on outer sheath.**
- Down ward out flow channel, out flow channel has a arrow marking on it depicting that it is meant for outflow



Classical outer sheath



Q: what is the name of method by which irrigant comes out of Iglesias sheath?

A: Siphon method / capillary method

Can be used with suction

Newer outer sheaths

New models of outer sheath are **rotating types**-means when the surgeon turns the resectoscope assembly 90° towards right or left lateral lobes of prostate, the **outer sheath doesnot turn** along with the movement, but **only the inner sheath and working element moves**.

Advantages:-

- the inner sheath and working element assembly rotates inside the fixed outer sheath, leading to a lesser torque on urethral wall as well as less friction.
- This leads to lesser chances of urethral stricture.

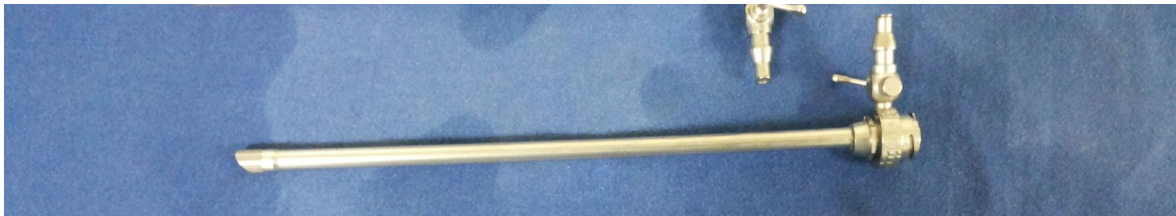
Such outer sheaths have both water inflow and outflow channels integrated on the outer sheath proximal end.

- **Conventional irrigation:** doesn't have outer sheath we have to empty bladder every time.
- **Continuous irrigation:** having outer sheath no need to empty bladder everytime speed of surgery increase.

❖ **Types of beaks:**

- **Long beak:** like cystoscope beak. It can occlude the bleeder during resection. Vision is poor.
- **Short beak:** not used now.
- **Oblique beak:** used now a days.

INNER SHEATH:



- For Inflow of irrigant
- 24 Fch
- Bakelite insulated tip. Now made of ceramic as current insulator.
- **Inflow (upward directed Luer lock) is coinciding to the hole in Schmidt's visual obturator.**
- **water or irrigant runs inside the inner sheath (between inner sheath and working element/scope) to reach into the bladder.**
- **Returning water enters the fenestrated holes and runs between the outer and inner sheath to come out finally from the outlet channel at the proximal end of outer sheath**

Newer inner sheaths

- Rotating types



Rotating type outer and inner sheath

Inner sheath has a Bakelite distal end and a rubber cuffing with hole at proximal end.

The hole of the rubber cuffing should come in direct alignment of inflow channel of outer sheath.

❖ **Uses of Bakelite or ceramic**

- As a current insulator. Needed for cutting chips –incoming activated loop comes upto 1 mm inside the inner sheath and the chip is detached from the main gland with the help of Bakelite

Q: will you use a resectoscope sheath with broken Bakelite tip?

A: no. it is dangerous as current may leak out and spread

❖ **SCHMIDT'S VISUAL OBTURATOR**



Q: what is the main use of visual obturator & its Benefit?

A: Allows atraumatic introduction

- Under vision insertion
- Simultaneous irrigation inflow

Q: how does water flow through the Schmidt's obturator?

A: there is a window in the shaft of Schmidt's obturator which aligns exactly under the inflow channel of the inner sheath. When obturator is in place, water enters through the inflow channel of inner sheath and drops straight down in to the obturator window. Water now travels inside the hollow shaft of obturator to reach the bladder.

Parts

Tip

- Smooth round tip for atraumatic insertion
- Telescope tip projects at the obturator tip

Shaft

- Hollow tube through which water runs around the telescope
- Proximal window for incoming water
- Male type lock with teeth to lock into the inner sheath proximal end

Base

- Angulated limb/Side channel for guidewire if needed
- Central arm for telescope
- Rotating female type groove lock into which fits the telescope

Q: What are the indn for using visual obturator?

A:

- **Watching institute (learning person)**
- **Large median lobe (on USG)**
- **After traumatic cystoscopy / dilation of urethera**
- **False passage**

Q: what are the other obturators?

A:



1. Blind obturator

2. Leusch obturator: it has got a rubber cuffing at the distal end and as the obturator is locked the rubber cuff projects out and covers the sharp edges of outer sheath.

3. Timberlake obturator → Hinged obturator for blind insertion. For median lobe. Angulated when it passed.



❖ WORKING ELEMENT



Parts:

Tip –

- sharp straight cut tip
- telescope comes out of the center of tip
- loop moves under the tip

shaft:

- hollow metal tube
- loop tunnel: additional hollow metal tube attached at the lower margin of main shaft through which the loop passes
- **Ratchet lock: at the proximal end of the shaft, ratchet type click lock mechanism into which fit the limbs of loop.**
- **groove type rotatory lock: for locking onto the inner sheath proximal end**

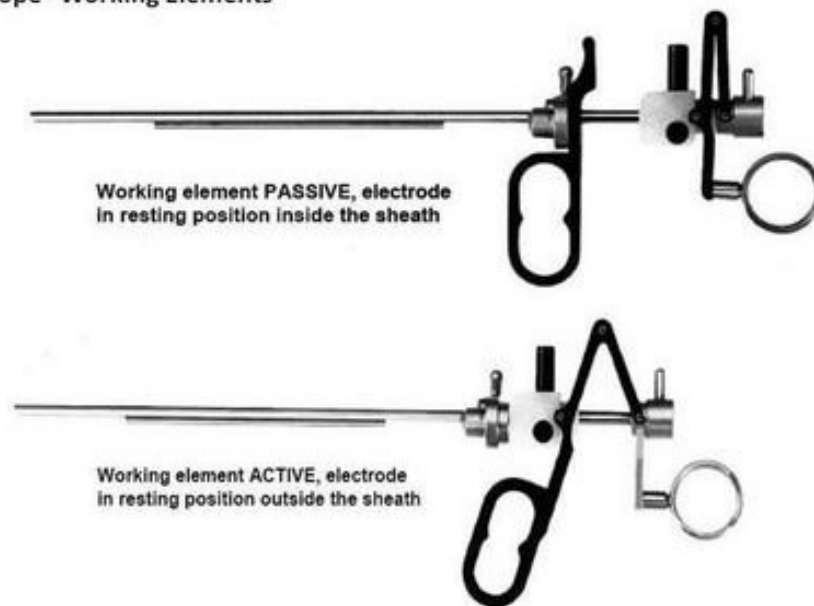
Handle:

- has two arms one for four fingers and other for thumb rest
- **loop unlocking knob:** just near to the finger grip arm there is a press knob to release the loop from the assembly
- **electrode groove-** just proximal to the loop unlocking knob there is a groove female type into which fits the electrode end of the hifi electric current cable
- **spring mechanism :** joining the two arms (finger rest and thumb rest) is the spring mechanism which sends the loop back into the resting position.
- **Depending upon the spring action the working element can be an active one or a passive one**
- Telescope lock: proximal end is a 'female type' rotating groove into which locks the telescope

❖ **Active type :**

- Also known as **Baumracker type..**
- At rest the cutting loop remains projected outside from the distal tip
- Loop is to be actively brought inside /or cutting is actively done using the forefingers handle while the thumb handle remains stationary
- The loop is passively sent out again by spring action.
- Finger arm movement.
- Advantage of fast cutting.
- But cutting is by active movement and if we exert more pressure cut is deep.
- Loop remains outside may injure bladder.

Resectoscope - Working Elements



❖ **Passive type:**

- Also known as **Nesbit type.**
- At rest the loop remains inside the sheath and needs a push by thumb to advance.
- The loop returns back with the help of spring action and cuts with the aid of thumb movement.
- The finger rest arm remains stationary.
- Advantages of controlled cutting.
- Loop remains inside so no risk of injury to bladder.
- Theoretical disadvantage of slow cutting.

Q: how to align the TURP set in exam?

A:

1. identify all the components properly –outer sheath, inner sheath, Schmidt’s obturator and telescope
2. take the inner sheath in left hand and check through the hollow shaft that no particulate is there inside it
3. check the Bakelite tip with right hand
4. pick up the obturator with right hand and insert gently into the inner sheath and securely lock it
5. hold this assembly in right hand.
6. pick up the outer sheath with left hand ,check the hollow shaft for particulate matter and insert the inner sheath + obturator assembly into the outer sheath . do not try to load outer sheath over the inner sheath +obturator assembly instead push the inner sheath +obturator assembly in outer sheath .lock this assembly
7. Now insert the telescope.
8. It looks nice if you do not fumble while aligning a TURP set , try not to keep the parts back on table once picked up and until properly align in one go without keeping them back on table ,then picking up again ,then placing on table and picking up and so on .
9. Always securely lock after each step

Q: why do you want to align the obturator first into the inner sheath?

A: Inner sheath has Bakelite at its tip which can break while introducing it directly into the outer sheath, particularly when the outer sheath is bent or has some particulates in it. So it is advisable to deploy the obturator first into the inner sheath. This makes a sturdy assembly and tip of obturator projects out of inner sheath making it safer to introduce into outer sheath.



Reck n penien type resectoscope with outer sheath (only single sheath –no inner sheath) having Bakelite.

water flow is intermittent type

Note the blind obturator and the Timberlake obturator.

❖ LOOPS

Classifications of loops:

- Depends on colour coding
- Stem number: single or double
- Size of sheath which can be used
- Depends on the thickness of loops



- Loops are made of tungsten wire.
- 0.35 mm standard thickness
- 0.3mm thin loop and .4mm thick loop.
- According to size
- 24 fch –yellow colour coded – fits into 24 and 26FR sheath
- 27 fch-brown colour coded – 27 and 28FR sheath.
- According to number of limbs
- Single stem
- Double stem

Most commonly used are 24 fch double stem electrode loops



Q: how does the current flow in a double stem loop?

A: the two limbs of the loop are not equal





- The longer limb actually connects to the cautery electrode.
- **The current travels from the longer limb to the loop and cuts the prostatic chip and returns through the cautery plate placed under patient via patient's body.**
- **The smaller limb is just for the support. In bipolar both the limbs are same.**
- **In bipolar current pass from one limb to prostate then to other limb and then having different mechanism.**



Q: how does the current flow in a single stem loop?

A: the lone stem is the active limb

- The current travels from the limb to the loop and cuts the prostatic chip and returns through the cautery plate placed under patient via patient's body.
- In this single stem design the stem is sturdier so that there is no supporting limb.

Cutting Loop Electrode	
	Roller Ball 3mm Electrode
Roller Ball 5mm Electrode	
	Collin's Knife Electrode

Q: what is the length, width and shape of a TURP chip?

A:

- Length – 3 cm
- Width – 8 mm
- Shape – boat shaped

Q: how much should the loop retract inside the sheath?

A: less than 1 mm

Q: what are the cutting loops made of?

A: Tungsten

Q: what are the sizes of thin loop & thick loop?

A:

Thin loop-wire thickness- 0.25mm diameter – for TURBT

Thick loop-wire thickness -0.35mm diameter – for TURP

24 Fch – yellow, 27 Fch – Brown

Q: can you cut or coagulate with a broken loop?

A: cutting –not possible

Coagulation –possible.

- Loop broken at passive arm: resection can be done but unstable loop so angulation is present.
- Coagulation without difficulties but cutting is very difficult.
- If loop is broken at centre: no cutting
- Coagulation possible.

Q: how will you keep the intravesical pressure low?

A: continuous sheath / SPC cannula (Reuters' cannula)



Q: how will you differentiate b/w the post traumatic stricture & hypo contractile bldr?

A: Post TURP stricture:

- Late presentation
- Gradual slowing down of stream over months
- Multiple crest & trough in uroflow
- Trough will not touch baseline

Hypocontractile Bladder:

- Immediate presentation at catheter removal
- Early presentation
- Trough will touch baseline

Q: what is the name of SPC cannula?

A: Reuter's cannula

❖ ELLICK'S EVACUATOR

Ellik was a resident at the University of Iowa under Alcock. According to the University website, Alcock encouraged Ellik to improve on the Davis evacuator for removing prostate chips. **A glass and red rubber Ellik evacuator, designed by Milo Ellik in 1937.**

Ellik MA. Modification of the evacuator. J Urol: 1937; 153: 327



At present, the most commonly used device for bladder irrigation is the Ellik evacuator. The Ellik evacuator comprises a pair of integrally formed chambers disposed in vertical alignment and having a restricted, central passageway in open communication between the two chambers. The upper chamber is provided with two ports, one of which is adapted for connection to a manually compressible bulb, the other of which is adapted for connection to a resectoscope for insertion into the urinary bladder.

Q: what all instruments are in the name of ELLIKS?

A:

- **ELLIK bladder evacuator**
- **Ellick's kidney stone basket**
- **Ellick's meatotome**
- **Ellick's Sound**
- **Ellick's stone dislodge**

Q: How does an Ellick's evacuator work?

A: In use the Ellick evacuator is completely filled with a sterile irrigation fluid and the resectoscope passed into the bladder. Upon compression of the bulb, the sterile liquid is forced into the bladder, and is withdrawn following release of the bulb. **Tissue and other particulate matter in the withdrawn fluid, which have a specific gravity greater than that of the sterile liquid, will tend to settle through the opening between the two chambers into the lower chamber.**

However, compression of the bulb produces eddy currents in the fluid in the upper chamber.

These eddy currents tend to cause a portion of the particulate matter to remain in suspension, with the result, that tissue and other particulate matter are reinjected into the bladder each time the bulb is compressed after the initial compression. This is particularly the case when small prostatic chips or frond-like segments of a papillary bladder tumor are present, as they tend to float in the upper chamber and do not settle into the lower chambers.

Q: What is the TURP cable known as?

A: H.F cable high pregnancy cable

100 kilo watt. 100 kw

This cable has a hole/socket at the patient's end into which the longer limb of the cutting loop comes and fits in.

Q: what are the uses of Collin's knife?

A:

1. TUBNI
2. Ureterocele incision
3. Bladder diverticular neck incision
4. TUIP
5. Sphincterectomy → side effects erectile dysfunction
6. Impacted VUJn stone
7. Endopyelotomy
8. PUV fulguration

STONE FORCEPS

- ❖ **Cistolitholapaxy:** intact removal of stone from bladder
- ❖ **Cystolithotripsy:** mechanical crushing of bladder stone
- ❖ **Cystolithotripsy:** stone breakage with energy sources
- ❖ **Cystolithotomy:** open stone removal
- ❖ **Suprapubic cystolithotripsy:** removal of stone from suprapubic puncture and dilatation by using energy

Maur Meyer stone punch



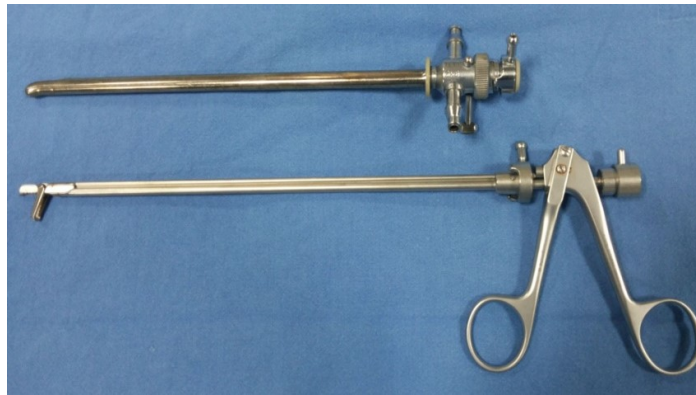
Components →

- ❖ **Outer sheath:**
 - 23.5 Fch, Straight, Oblong in cross section
 - **Intermittent flow sheath**
 - At the proximal end there is a **knob for water inflow-outflow control**
 - Knob up means inflow open
 - knob down means outflow open
 - ❖ **Obturator –**
 - Blind obturator
 - Visual Obturator –almost same as Schmidt's visual obturator
 - ❖ **Working element: stone punch**
- **Tip**
 - At the tip there is a **downward opening space of 2cm to hook up the stone, lift from base of the bladder to centre of bladder & then crunch.**
 - There is sharp edged punch at the distal tip that strongly bites into the stone to crush it
 - **Shaft-**
 - There is a solid sturdy shaft
 - Telescope passes under the shaft
 - There is a **1 inch tunnel for telescope** to pass under the working element at the distal end of working element
 - **Proximal handle**
 - There is a handle for thumb and fore finger at the proximal end with spring mechanism in b/w.

General issues about stone punch

- As the telescope passes under the working element it is advisable to **use 0° forward viewing telescope** otherwise the distal end of stone punch will not be seen
- Stones which are **bigger than 2 cm**, that is, bigger than the size of stone punch gap **cannot be broken**
- Stone is broken between distal sharp edge of working element and distal end of outer sheath
- Stones which are too hard are difficult to manage
- **Chances of bladder injury** if bladder mucosa is entrapped in the punch

❖ Alligator stone forceps



Sheath-

- **25 fch straight**, oblong (in cross section), **intermittent type water flow** with knob type control valve for water inlet or outlet
- Sheath requires a blind obturator to get introduced into the bladder

Working element –

- Tip is like alligator's jaw
- Stone is crushed between the two jaws of working element
- Only the **lower jaw moves**, upper is fixed
- Male type groove lock proximally
- Scope passes under the shaft of working element

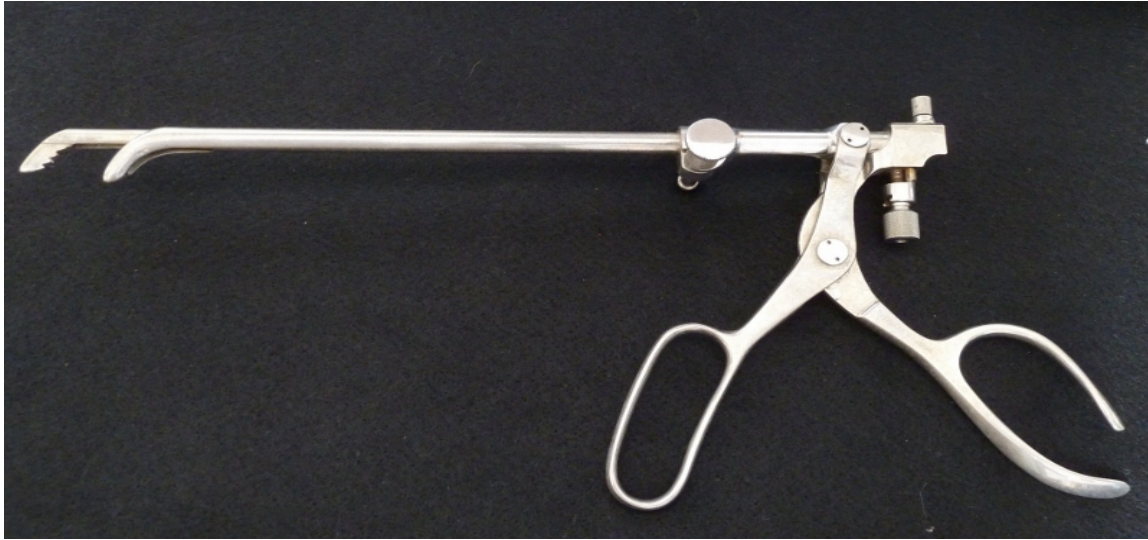
Handle

- Scissors type handle action

General issues about Alligator stone forceps

- As the telescope passes under the working element it is advisable to use **30° viewing telescope** **otherwise the lower jaw is difficult to see**
- At a time only one jaw can be seen properly
- Stones which are too hard are difficult to manage
- Chances of bladder injury if bladder mucosa is entrapped in the jaws
- The forceps can break inside the bladder
-

❖ **Hendrickson lithotrite**



Modified Hendrickson lithotrite



Hendrickson lithotrite or Optical lithotrite

- **Entry : Blind** , the curved part blades are introduced in bladder almost like curved dilator fashion
- Mechanism : mechanical stone crushing Under vision
- Telescope: 70°, 30°. Telescope
- Stone size : 3 cm length
- Handle: Scissor handle.
- Dis advantage – **the two jaws can stuck/ get jammed inside the bladder with stone in between the jaws making it difficult to remove the instruments**

Modified Hendrickson lithotrite

- There is a rotating screw lever to tighten the blades
- The blades are completely **dismountable**- so that if they got stuck inside the bladder they are dismantled and removed one by one

❖ Patankar Bridge

It is a **double barrel bridge with the two barrels running one over the other.**

the upper channel is for telescope

the lower channel is for the lithoclast

- a **25 fch** standard cystoscopy sheath is introduced under vision
- the standard diagnostic bridge is removed and Patankar double barrel lithoclast bridge is introduced with telescope in the upper barrel
- The lithoclast energy probe is passed through the lower channel of Patankar Bridge and with the use of pneumatic energy the stone is broken
- Keep the bladder minimal filled to avoid wandering away of the stone
- Stone fragments are removed using Ellick's evacuator

❖ FOLEY'S catheter

The name comes from the designer, **Frederic Basil Foley**, a surgeon working in Boston, Massachusetts in the 1930s. His original design was adopted by **C. R. Bard, Inc., who manufactured the first prototypes and named them in honor of the surgeon.**

Foley first described the use of a self-retaining balloon catheter in 1929. His design incorporated an inflatable balloon towards the tip of the tube which could be inflated inside the bladder to retain the catheter without external taping or strapping. He demonstrated this to the **American Urologists Society in 1935**, and published a paper describing it in 1937. While he was still developing his catheter, a **patent was issued to Paul Raiche of the Davol Rubber Company of Providence, Rhode Island in 1936**. Four months later, in October 1936, Foley applied for the patent, and was awarded this after appearing before the patent office Board of Appeals. Raiche appealed this decision in court, and it was overturned, returning the patent to Raiche. A further request for a hearing made by Foley was refused, and so the **patent stayed with Raiche.**

The C. R. Bard Company of New Jersey started distributing the catheters, under the name of Foley catheters, from 1935; consequently, the name has remained with Foley despite the patent having remained with the Davol Company.

Q: what are the colour codes of foley's catheter?

It is international colour coding system

Fch	Colour	Length	
8	Aquamarine [Black]	30 cm	2 way only
10	Black[Grey]	30cm	“
12	White	40 cm	“
14	Green	40 cm	“
16	Orange	40cm	“
18	Red	40cm	2 way/ 3 way
20	Yellow	40cm	“
22	Purple	40cm	“
24	Blue	40cm	“

Q: what is the material of foleys catheter?

A: latex

Now a days most of the foleys catheters come as siliconized coated latex.

Q: what is the length of foley's catheter?

A: 40 cm standard; except 8 & 10 (pediatric) = 30 cm

Q: which Foleys sizes are 3 way?

A: 18 Fch & above.

Q; what are the other works of foley's?

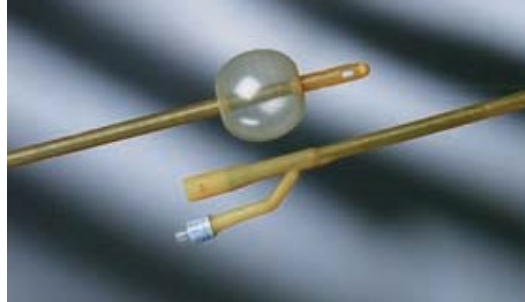
A: In addition to his work on urinary catheters, Foley also described a novel technique for treating strictures of the pelvi-ureteric junction which is known as the **Foley Operation** or the **Foley Y-plasty pyeloplasty**. He also invented a **hydraulic operating table** and a **rotatable resectoscope** and described the **first artificial urethral sphincter**.

- **Guyon foley catheter introducer.**

Name of foley catheter introducer – Guyon foley catheter introducer.



Hematuria catheter



Hematuria 2-Way Foley Catheter 22Fr/ 30cc Balloon Capacity, Hydrophilic, Long Open Coud Tip, Sterile

The shaft of the catheter is reinforced with a **wound metal/nylon coil** that offers **significant resistance to collapse under the vacuum of irrigation**. The additional strength of the coils assures users that any blockage can be cleared by irrigation. In addition, the **coils add resistance to any collapse under the balloon from the pressure of inflation**. Also having large eyeholes to reduce the risk of clot blockage.

❖ **Advantages of silicon catheter:**

- Less irritant
- Decrease wear and tea
- Less prone to encrustation
- More rigid.

❖ **16FR catheter means diameter of catheter is 16FR and circumfrance of that catheter is 16mm.**

As circumfrance = $3.14 \times \text{diameter}$

Inner lumen of 24FR two way catheter is larger then inner lumen of 24 FR three way catheter.

❖ PCNL ...INITIAL-PUNCTURE NEEDLE

Q: what is the technical name of PCN needle?

A: Initial Puncture needle

- Bivelled tip → chiba needle
- Diamond tip → Franseen type needle

Q: What are the components of I.P needle?

A:

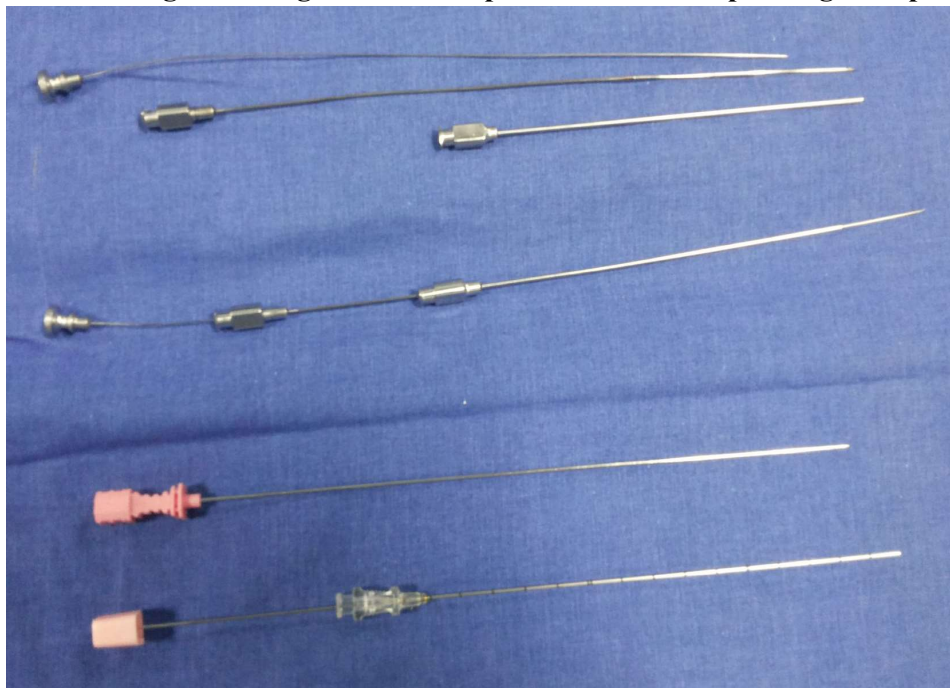
Two piece needle – sheath

- Trocar – Beveled or diamond tip

Three piece needle → I.P needle (Von Sonenberg type)

- Central needle
- Introducer cannula (middle)
- Outer cannula sheath

❖ No specific advantages of using two or three piece needle. It is upto surgeon's preference.



Q: what are the features of Chiba needle?

A: fine Trocar

- Outer sheath → with centimeter markings
- Luer lock hub for fitting syringes
- Hub is radiolucent
- Shaft is radio opaque
- **Standard length -15 cm ...longer needle is 23 cm**
- **Echogenic tip for USG guided insertion.**
- **Tip protrudes 1 mm from the distal end of the trocar.**
- **Diamond tip** – prevents deflection by sharply cutting through muscle and fascia while causing minimal shearing.
- A **beveled tip** tends to deviate in a direction away from the bevel. A diamond tipped needle runs a straight course.
- **In general, the shorter the needle (11-15 cms) the easier it is to control.**
- **Longer needles are necessary for obese patients or when triangulation is utilized, because this later technique may require a longer tract or more flexibility to ‘bend around’ a rib.**
- Standard I.P. needle takes a 0.035 G/w.
- The alternative access needle system uses a 21-gauge primary access needle that accepts a stiff-bodied .018-inch guidewire.
- The use of a dedicated conversion catheter over this .018-inch guidewire permits subsequent introduction of a .035- or .038-inch guidewire into the collecting system for further manipulations.



Q: What is the degree of Beveled edge?

A: 16°

Q: what are the standard sizes of I.P needle?

A:

- **18 Gauge – 0.035 G/w**
- **21 Gauge - 0.018 G/W**

Q: what disadvantages of Beveled tip?

A:

- deviates from the tract
- More bleeding
- Diamond tip needle → straight course.

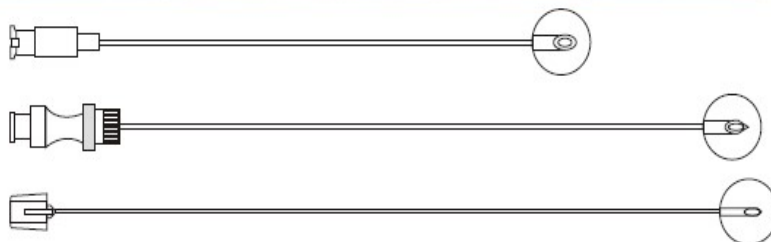


Chiba tip – designed at Univ. of Chiba, Japan, Bevelled tip, 16 degrees, Echogenic

Q: when will you need longer needles?

A: obese patient

Triangulation Technique.



Q: what are the advantages & disadvantages of using 21 Gauge needle?

Advantages:

1. minimal Trauma
2. Multiple attempts can be made
3. Rarely perforation

Disadvantages:

1. necessity of changing G/W

Takes only 0.018 G/W



Dilate tract over 0.018

- Co axial introducer: incorporates small catheter and advance over it. Finally introduced large guidewire.
- Graduated introducer over 0.018 guide wire few centimeter proximal to tip having hole through which 0.035 gw can be passed.
- 2. Doesn't maintain adequate trajectory
- 3. Increase one more step to procedure.

❖ 18 gauge needle:

Advantage:

1. More sturdier
2. Maintains tract

Disadvantages:

1. More traumatic
2. Multiple attempts can't be made

❖ Theoretically it is said use 21 gauge needle in initial phase of learning and then use 18 gauge when you are expert.

But practically all are using 18 gauge.

❖ Smart needle: Impedance based smart needle to confirm PC system puncture.

Inner stylet electronically insulated from outer sheath. Drop in resistivity when needle passes through parenchyma to PCS.

❖ Initial puncture FOR PCNL

❖ USG guided:

- Advantages:

1. No radiation
2. Ability to assess intervening organs
3. No need to inject contrast or dye for puncturing

- Disadvantages:

1. Limited view of field
2. Less clear visualization of needle.

• USG guided puncture mostly done in:

1. Completely obstructed ureter
2. Diversion conduit



3. When radiation exposure is of concern
4. Transplanted kidney
5. Ectopic kidney

❖ **Floro guided:** most used method for puncturing

1. **Bull's eye method**
2. **Triangulation method**
3. **Lateral progression method**
4. **Direct stone hit method**

Disadvantages:

1. More radiation exposure
2. Intervening organs cant be traced
3. Dye or air must be needed for puncturing so if RGC cant be negociated over the stone then cant be usefull.

❖ **Blind assess:**

1. Through superior lumbar triangle:

- Superiorly: inferior border of 12th rib
- Inferiorly: by internal oblique
- Medially: sacrospinalis, quadrates lumborum
- Laterally: external oblique
- Insert 3-4 cm deep needle 30 degree cephalad

2. Lateral to L1 1 to 1.5cm directly into pelvis

Disadvantages: more vessel injury

No support of parenchyma for sheath movment.

❖ **Advance guidance for puncturing:**

- **CT/MRI guided puncture**
- **3D USG guided puncture**
- **PAKY RIM: percutaneous access to kidney with robotic arm**
- **All seeing needle: modified needle with 1.6mm outer diameter through which micro optic 0.9mm needle. Complete visulisation of tract with zoom effect.**

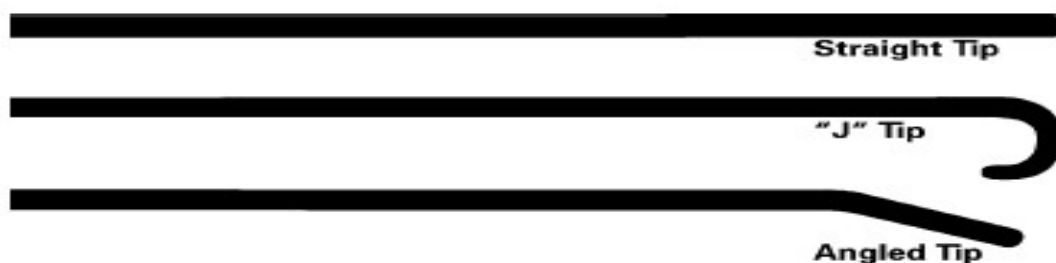
❖ **How to reduce radiation during PCNL?**

1. **USG guided puncture**
2. **Collimation of image**
3. **Foot switch of floro with surgeon**
4. **Last image hold in floro**
5. **Pulse fluoroscopy**
6. **Image intensifier**
7. **Single shoot only at the end of dilatation**
8. **DJ stenting under direct vision.**

❖ GUIDEWIRES [G.W.]

Guidewires-Principles

- Serve to provide access to a particular area of the urinary tract and also as a guide/track to pass catheters, stents and sheaths.
- The property varies with respect to **length, diameter, composition, tip design, surface coating and shaft rigidity**.
- The diameters and lengths range from **0.018 to 0.038 inch** and **145 to 280cm** respectively
- All guidewires are **radio opaque to allow x-ray guidance** to determine their position.
- Usually come pre- packaged in a coiled sheath to allow easy handling and storage.
- **Size**
 - Size refers to diameter measured in inches
 - Most common sizes are **0.035 inches** or **2.7 Ch** and **0.038 inches** or **2.9 Ch**.
 - Smaller wires for pediatric age group eg size **0.025 inch** and **70cm length**.
- **Tip Design**
 - Straight or angled
 - Straight is usually adequate for most cases
 - An **angled tip** is useful for **negotiating an impacted stone** or for placing the guidewire in specific situations.
 - A j-shaped tip can negotiate an impacted stone **(it can suddenly flick past the stone, in a situation where a straight guidewire may inadvertently perforate the ureter and thus create a false passage)**.



- **Surface Coating**
 - Most guidewires are coated with **PTFE – polytetrafluoroethylene** which has a low coefficient of friction, thus allowing easy passage of the guidewire through the ureter and of instruments over them.
 - Some coated with polymer are very slippery when wet. Some are coated just at the tip, whilst others are coated along the entire length.
- **Tip Rigidity**
 - The tip of all guidewires are soft and therefore flexible, which reduces but does not completely eliminate the risk of ureteric perforation.
 - Length of the floppy tip may vary, eg, 8 cm instead of 3cm tip
- **Shaft Rigidity**
 - Stiff guide wires are easier to manipulate than floppy ones and help to straighten a tortuous ureter.

- Very malleable wires can be very useful in bypassing an impacted stone just like the J-tipped wires.

Q: what are the sizes & length of G.W?

A: Sizes 0.018 – 0.038 inch

Length 150 cm (standard) range 60-260 cm

Q: what are the specificities of G.W tip?

A: *According to design:*

Straight tip – regular,

Angled tip → for difficult 11.0

‘J’ tip → for other tortuous ureter, for PCNL

According to flexibility of tip

Regular: distal ‘3’cm flexible

Bentson: distal 15 cm flexible

Q: what is the mandrel?

A: Mandrel means Axle / Axis

Usually represents a solid bar around which something is moulded

Q: what are the components of Guide wire?

A: Mandrel → central metal rod

Spring → Lightly woven spring around mandrel

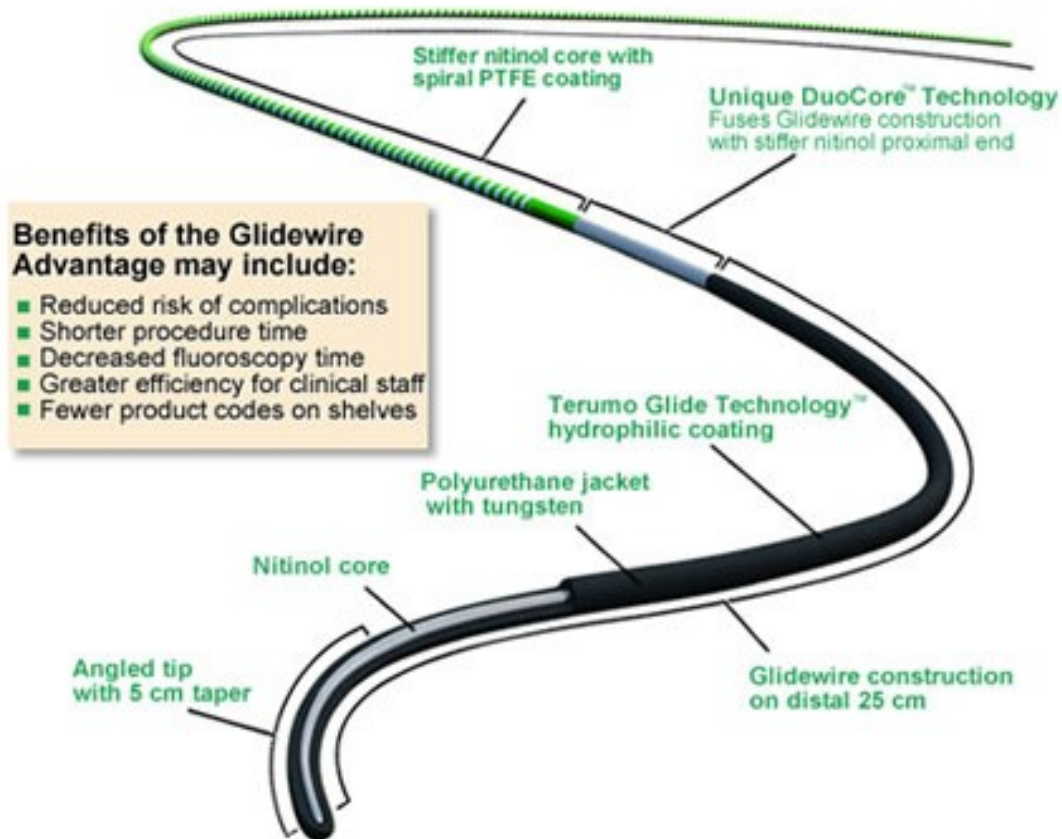
Coating → hydrophilic or regular

Q: Describe the components of Terumo & zebra?

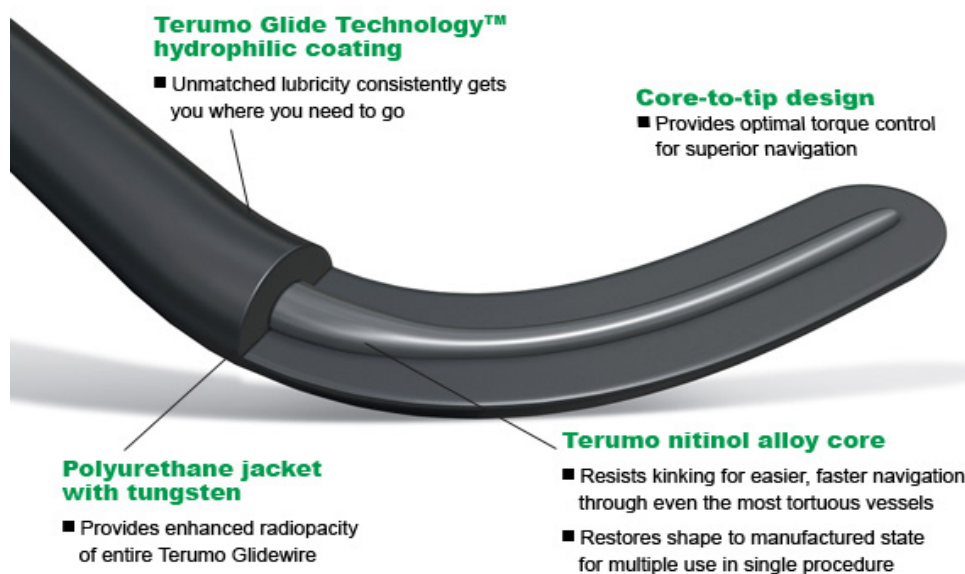
A:

	Terumo	Zebra
Other name	Glide wire	Stiff wire
Mandrel	Nitinol-nickel,-Titanium	Nitinol (initial zebra wires had stainless steel core)
Spring	Teflon=PTFE	Stainless steel
Covering coat	Polyurethane with Hydrophilic co-polymer	PTFE
Radio-opacity	Complete radio-opaque	Distal 4 cm opaque Then 4 cm radio lucent Rest complete opaque

Terumo glidewire



Terumo's tip



- Excellent for maneuvering in a tortuous or kinked ureter and around an impacted ureteral calculus but often lack sufficient rigidity for the passage of catheters and stents and may migrate out of the ureter during manipulation.

- The Nitinol core allows maximal deflection without kinking, while the tungsten ensures high visualization during fluoroscopy.
- Coating is a micro thin layer of hydrophilic polymer that, when activated, attracts and holds water and other liquids to the guidewire, creating a low-friction surface

Q: what makes the Terumo radio-opaque?

A: tungsten

- ❖ **Hybrid wire:** nitinol core at distal 5cm having hydrophilic coating with floppy tip. Rest of wire has PTFE coating.
 - Serve as both access wire and safety wire.
- ❖ **Stainless steel core wire:** core of stainless steel with PTFE coating.
 - Used for dilatation of tract or for stenting.
 - More stable doesn't slip.
 - More prone to kink.
 - High chances of perforation and submucosal passage
- ❖ **Bi wire: specially for RIRS.**
 - Floppy tip at both ends.
 - Hydrophilic coating with nitinol core
 - Distal floppy tip for atraumatic ureteric insertion and proximal floppy tip for rail roading of flexy scope.

❖ **Zebra Stiff Wire:**

Distinct Construction

- Kink-resistant Nitinol core
- Flexible PTFE "jacket" designed for torqueability

Enhanced Visualization

- **Blue and white striped pattern** is designed to provide clear endoscopic visualization of wire movement
- **Platinum distal tip** is visible under fluoroscopy to aid in confirmation of guidewire position

Lubricious Coating

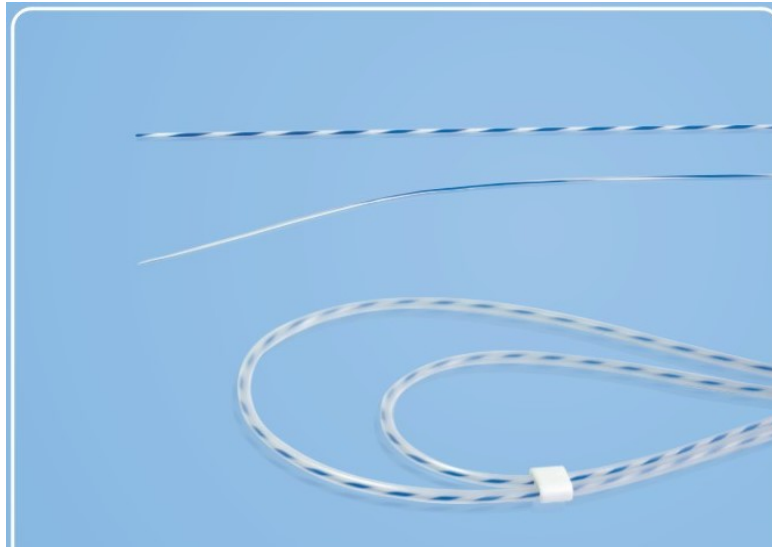
- Uro-Glide™ Coating on distal 60cm designed to reduce surface friction for smooth entry, advancement and withdrawal with precise proximal handling

Accessories Supplied

- Torque Vise is packaged with the product and offers the physician fingertip torque control required to negotiate difficult anatomy and gain access beyond impacted calculi

Latex Information

This product contains no detectable latex.

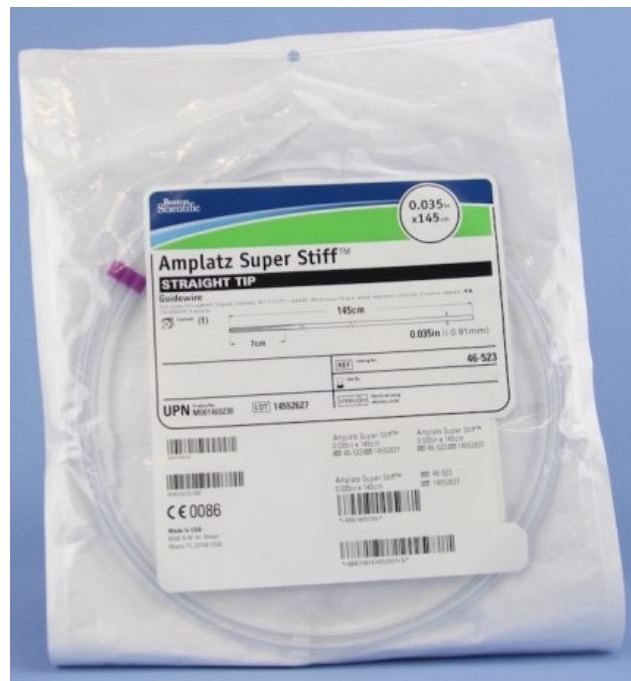


Q: What are the examples of stiff guide wires?

A:

- Lunderquist guidewire
- Amplatz super stiff

Amplatz superstiff guidewire is nothing but like an Amplatz stiff guide rod with two differences .one the shaft is narrow and seconds the distal tip 5 cm is floppy



Q: What is fixed core & movable core guidewires?

A: If spring is welded (fixed) to mandrel → fixed

If spring is not welded to mandrel → Movable guide wires.

How to pass safety wire in PCNL?

Do initial puncture – put 0.035 G.W.- fascial dilator – alken canula (9fr) – over that put safety wire and remove canula.

Dilatation over one wire and one wire kept outside as safety wire in case of lost tract.

❖ RETROGRADE URETERIC CATHETER RGC

Q: what is the other name?

A: Retrograde catheter RGC

Q: what is RGC made up of?

A: Polyurethane

Q: what is the length & dimensions of RGC?

A: **70 cm length (Roughly equal to Flexiureteroscope)**

Markings at every centimeter, but no marking beyond 50 cm.

Size → 3-8 Fch

3, 4 fch RGC takes up = 0.028 guidewire

5,6,7,8 fch = 0.035 Guidewire.

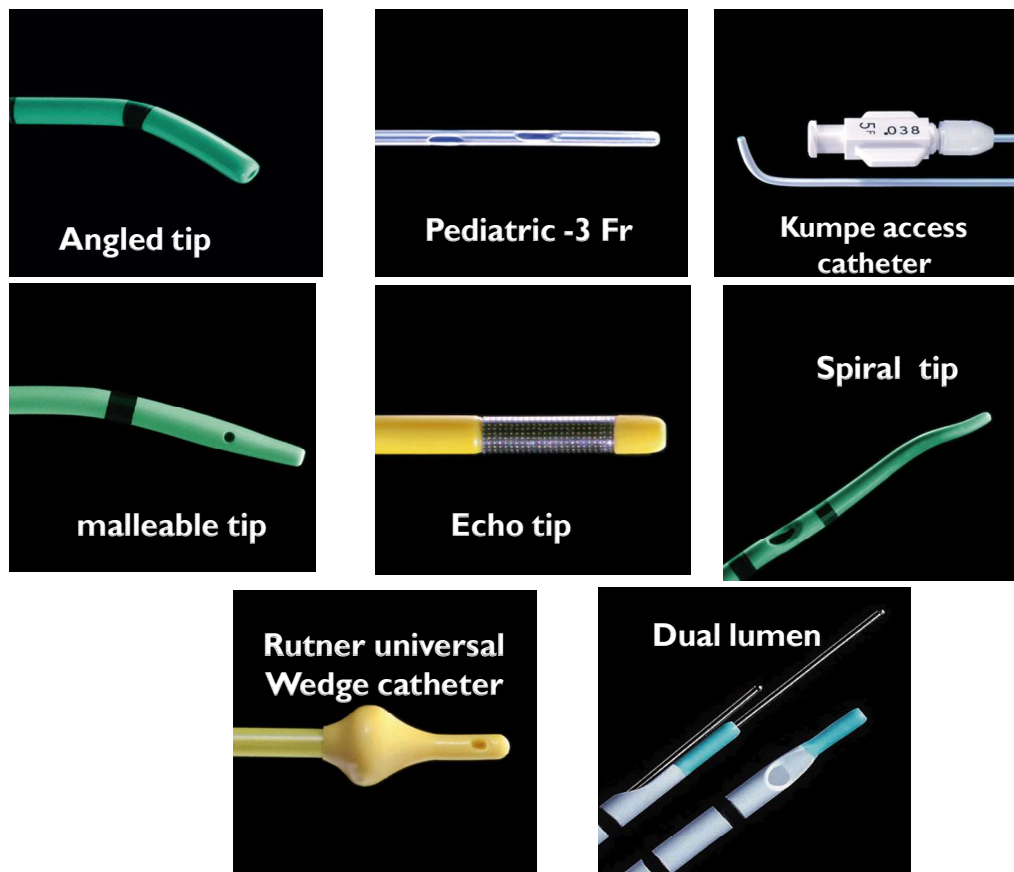
Normally for PCNL 5FR and in children 3 FR RGC is used.

Q: what are the types of RGC tips?

A:

- open ended
- Close ended
- Round tip
- Olive tip
- Conical tip
- Bulb tip
- Whistle tip





Q: what are the uses of RGC catheter?

A:

1. For Bulb ureterogram
2. for RGP – Before PCNL
 - Before stenting
 - Urine sampling from ureters.
3. for exchange of wires/ Guidewires
4. Tract securing before endopyelotomy.

New packed RGC catheter comes with a metal stylet and white coloured connector.

❖ **Types of RGC and uses:**

1. **Cone tip:** cone at distal end. Describe size of cone and catheter on RGC. Like 4/8 means 4FR RGC with 8fr bulb. Used for bulb ureterogram. It has to back load on scope.
2. **Angle tip:** for negotiating awkward positioned orifice.
3. **Whistle tip:** for uretrogram
4. **Pig tail:** single coil into kidney. Self retaining michenism
5. **Echotip:** for drainage and irrigation. Echotip band is enhanced under sonography.
6. **Double tip:** for putting guide wire and RGP. Second tip is 1 cm proximal to tip.
7. **Spiral tip**
8. **multi holes:** for irrigation in superperk PCNL

❖ **Advantages of keeping RGC in PCNL?**

1. For RGP with air or contrast
2. Prevent stone migration
3. Reduce intra pelvic pressure
4. Help to decompress in case of perforation
5. Help in putting DJ stent
6. Identification of pelvis with instillation of betadine

RGC with stylet used in:

1. PUV fulguration
 2. Ureterocele incision
 3. For meatotomy
- Cautery current has to touch to stylet.

❖ **PCNL DILATORS**

Q: what was the historical method of dilating PCNL tract?

A: Gradual dilation using telescopic dilators (Alken) over 8 days.

Q: who described acute dilation of PCNL Tract?

A: Castaneda – Zuniga

Q: What are the types of dilators you know?

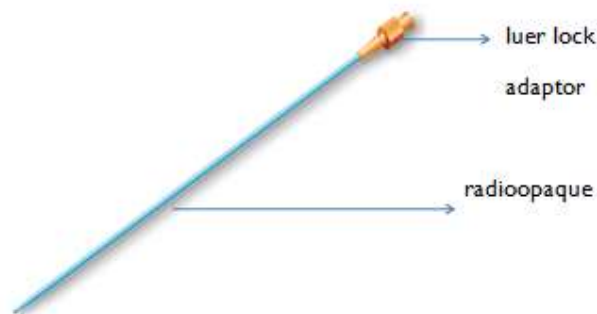
A:

- Progressive fascial dilators (Amplatz)
- Metal co-axial dilators (Alkens)
- High pressure balloon dilators
- Single step screw dilators

Q: Describe Amplatz dilators set?

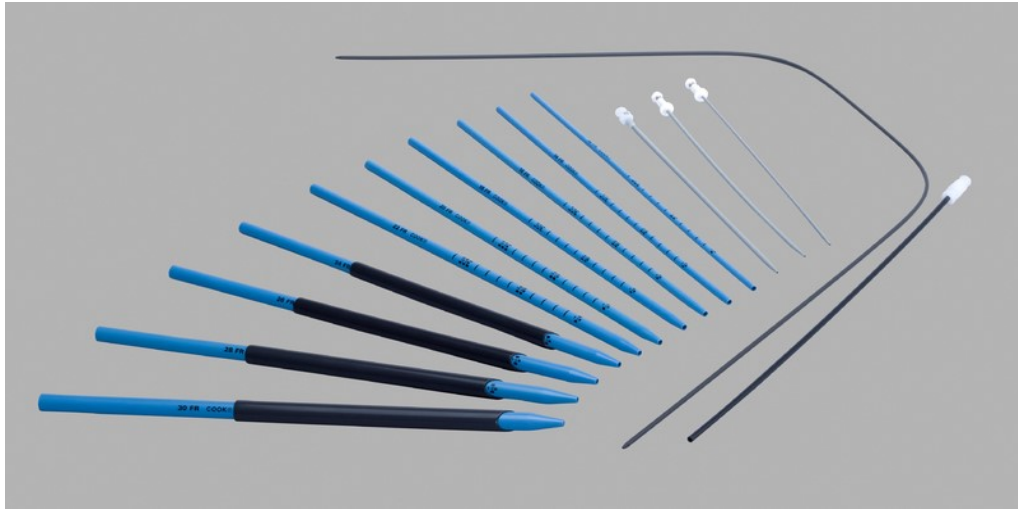
A: **Progressive sequential semirigid plastic dilators**

- 8 Fch Radio-opaque PTFE catheter (snake catheter)
- 3 radio opaque dilators – 6,8,10 Fch,
- all tapered to fit on 0.035 G/W



- **10 dilators** 12,14,16,18,20,22,24,26,28,30
- Amplatz sheath only with 24,26,28,30
- With the advent of mini perc, Now a days Amplatz sheaths are available in almost all sizes





Q: what is the increment b/w two Amplatz dilators?

A: 2 Fch

Q: what is the length of Amplatz dilators?

A: 30 cm,

Dilators have cm gradations with specially notified 5cm, 10cm, 15cm.

Dilators of **35 and 40 cm** length are also available for obese patients.



Q: How will you insert snake catheter/ central rod?

A: needle → Glidewire → 6 Fch → 8 Fch- → snake catheter (we use metal guide rod instead) and over that trac dilatation.

Q: How will you insert rest of the dilators?

A: over G/W + snake dilator combo

Over guidewire + central rod combo

Sequentially / rotatory movements.

Q: what are the disadvantages of Amplatz dilators?

1. Repeated shear trauma in renal parenchyma
2. More Hemorrhage due to loss of temponade from parenchyma
3. Extravasation and Trauma due to irregularities the leading edge of Amplatz dilator
4. Disposable device
5. Coastly
6. Underdilatation of tract
7. More time consuming

8. Tract may lost

Advantages:

1. **Less chances of kinking of wire**
2. **Theoretical less trauma to PCS**

Q: what is a screw dilator?

A: dilator with the tip in the form of screw.



Q: Describe the Amplatz sheath?

A:

- Paired with 24,26,28,30 Amplatz dilators
- Length **17 cm**. Extra long Amplatz of **20 and 30 cm** are available for obese patients.
- One end **Beveled**.

Advantages of beveled end:

1. **Bevel tip can obliterate bleeding without hampering the vision**
 2. **One side of Amplatz can extend further then other side which allow maintaining access into PCS where system is not dilated.**
 3. **Sheath repositioning can be done easily.**
- But with the bevel end it is difficult to have **eddy current** effect in stone removal.
 - But now with miniperc Amplatz with both straight ends are available.
 - Made up of **Teflon**. **Minimal buckeling and reduce friction co- efficient.**
 - With the advent of mini perc, Now a days Amplatz sheaths are available in almost all sizes



Q: what are the advantages of Amplatz sheath?

A:



Maintains the tract all the time

- Tamponade
- Blocks & Traps the stone
- Direct removal of stone without breaking (up to 1cm)
- Allows multiple passes of scope
- Nephrostomy drain tube placement.

❖ ALKEN DILATORS

Q: what is the type of Alken dilators?

A: metal-Co-axial dilators.

- Progressive enlarging co axial metal dilators



Q: what are the components of Alken set?

A:

- 8 Fch hollow metal rod-guide rod
- 8 metal tubes + Amplatz sheath 30 no.

Q: Describe the guide rod / central Rod?

A:

- **8 Fch**, bulb at distal end which is of **9FR** diameter which doesnot allow dilators to move forward
- 58 cm length
- Central rod in deployed over G.W



Q: Describe the metal tubes?

A:

- 8 metal tubes
- 9,12, 15,18,21,24,27,30 Fch
- ❖ Distal tip – Converging tip

- Exactly fits the previous dilators. Inner end of each dilator at distal end is design in such away that it doesn't go beyond the previous dilator.
- Distally all dilators are in same plane.
- Distal end has sharp edges which cuts the tissue while passing.
- If inbetween number dilator is not available then not to used the set it can damage renal parenchyma.
- 20cm lengh. No markings like Amplatz dilators.

❖ Proximal End = Screw / Grooves - for grip
Only Fch size & company mentioned.

Amplatz sheath is threaded over last Alken dilator and all Alken dilators removed → Introduce nephroscope.

Q: what are the adv & disadv of Alken dilators?

A: Adv:

1. **Good for pts with previous Surgery ,**
2. **Peri-renal fibrosis**
3. **Re-usable**
4. **When wire access is precarious, for eg. When it is clubbed in calyx over stone.**

❖ Disadvantages:

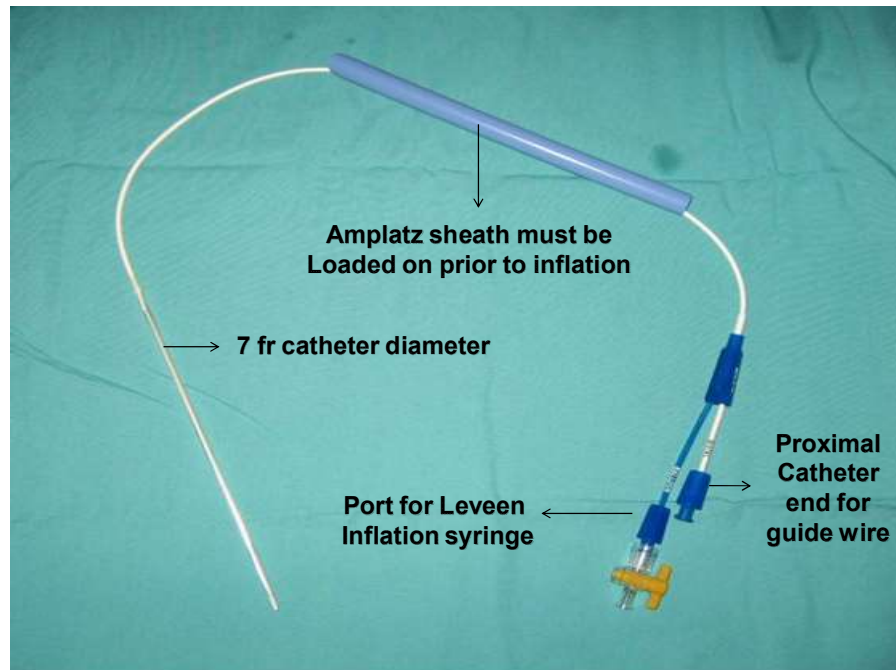
1. **Difficult to control pressure exerted during dilation**
2. **Metal rod can counter perforate PC system.**
3. **Possibility of kinking wire**
4. **High chances of infundibular tear**

❖ BALLOON DILATORS

Q: Describe the components of balloon dilator set?

A:

- Initial puncture needle
- Guide wire
- 7 Fch catheter diameter (central catheter) with Radio opaque tip.
- **30 Fch Amplatz sheath already Back loaded over central catheter**
- **Proximal Bifid end**
 - One channel for Guidewire**
 - Second channel for Leveen syringe**
- Piston of Leveen syringe is not a pushing type but had screwing rotator movements.



- Length of balloon is **17cm**.
- Maximum allowable pressure is **20ATM**.

Q: what is the best method of tract dilation?

A: Balloon catheter

- **Minimal Bleeding**
- Single step dilation
- For the fascial, malleable and metal coaxial dilation systems, the major risk of injury results from the uncontrolled repetitive passage of progressively larger dilators.
- Balloon dilation catheters provide nephrostomy tract dilation in a **single step**.
- **Before inserting the balloon dilator, the 30 Fr. Polyteflon working sheath is back loaded behind the un-inflated balloon.**
- The catheter is then inserted over the guidewire until the inflatable segment traverses the nephrostomy tract.
- The tip of the balloon, indicated by the radiographic marker is inserted just inside the calyx.

Q: Upto what level will the tip of balloon catheter inserted?

A: up to calyx not beyond Calyx.

Q: What is the pressure required to dilate the tract?

A: 4-5 atmospheres for 'virgin' kidney

Q: where will the "waist" appears?

A: at renal capsule or renal scar.

- **Balloon dilator compare to other axial dilators is radial dilator. It works by lateral compression force rather than lateral shearing force.**
- **Distal end of balloon should be kept close to pcs.**

❖ Advantages of balloon:

1. Easy
2. Single step dilator
3. Rapidly achieved dilatation
4. Applicable for hypermobile kidney also
5. Theoretically minimal bleeding among all dilatation methods.

❖ Disadvantages:

1. Less effective for scarred kidney
2. Under dilatation of tract
3. Expensive
4. Single time usable.

❖ Single step screw dilators:

- Gradual dilatation of single dilator from distal to proximal
- Proposed advantage that it reduced access time and fluoroscopy time without increase complications.
 - Severely scarred kidney where other methods are failed then atherotomy cutting balloon can be used for dilatation of tract.

❖ NEPHROSCOPES

- *There are so many models from each company*
- *Prototype models are described here*

Q: what are the components of nephroscope?

A:

1. Outer sheath (24 F) with outflow Luer locks.
2. Scope proper (20 Fr) shaft
 - With integrated light source pillar
 - With integrated offset eyepiece.
3. Obturator
4. Bridge (for Olympus)

Q: Describe Olympus nephroscope irrigation system

A: shaft 22 Fch, hollow, integrated with light source port & offset eye piece

- Outer sheath 24 Fch has both inflow & out flow channels.
- In some scope outer sheath has outflow channel, and inflow is integrated with main scope shaft.
- There is a hole in proximal end of nephroscope shaft which coincides with the inflow channel (same as in Schmidt's obturator sheath)
- Lithoclast passes through the same channel, as of water, inside nephroscope shaft.
- Water exists through the small holes in outer sheath, travels b/w nephroscope shaft & sheath and then exists, through outlet in sheath.
- **If outer sheath is not used then Amplatz sheath acts as the outer sheath.(But bridge is required for inlet (inflow) in case of Olympus)**



❖ **Wolf's Dresden nephroscope is also known as universal nephroscope.**

- **It is pano view (wide angle of vision)**
- Autoclavable
- **20.8FR** outer sheath and without sheath it is **19.5 fr.**
- **12-13FR** working channel. **9FR** forceps can be passed. **2.5mm** lithoclast probe can also be passed.
- **It has offset lense with 12 degree angle of vision to see forceps and stone in calyx.**
- **Two prism** in Dresden type nephroscope.
- Straight working channel.
- Bakelite eye piece to see without camera in pre camera era.
- Inflow channel is mount inbuilt in scope. No need of bridge.

❖ **Different designs of nephroscopes:**

- **Dresden type – wolf**
- **Merberger type – Olympus**
- **Straight**
- **Lateral type - stortz**

Q: what is a slender nephroscope?

A: It's a narrow body nephroscope

With outer sheath 22 Fch

Inner shaft 20 Fch

Working length 20 cm

Q: what is the difference b/w Karl storz & Olympus nephroscope?

A:

- Karl –storz has an integrated inflow channel
- Out flow channel is in the outer sheath.

Olympus has no integrated side channel and inflow/outflow are with outer sheath or with a separate Bridge.



STORZ nephroscope

- Light pillar is mounted on the opposite/same side of water channel
- Olympus has an ipsilaterally mounted light pillar with no water channel.
- Water inflow & outflow are on sheath / bridge.

❖ **How to decrease wear and tear of nephroscope?**

1. Use nephroscope with sheath to reduce torque
2. While removing the stone completely remove the assembly with forceps and scope. Not only the forceps
3. Don't fire energy within scope



Olympus Nephroscope Bridge

Q: what is the size of working channel of standard nephroscope?

A: 12 Fch = 4mm

Q: what is the angle of view (tilt of lens?)

A: Nephroscope: 10°

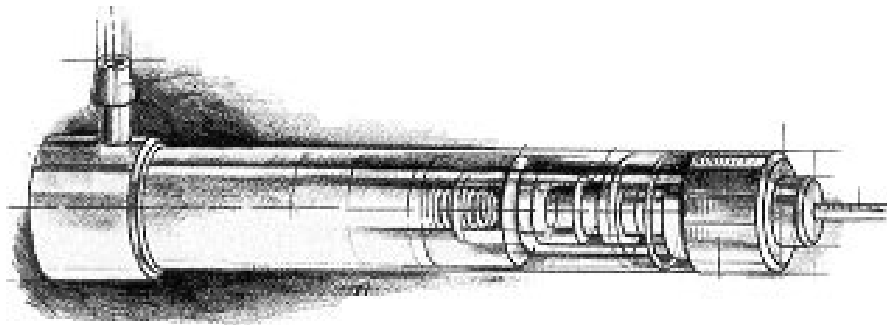
Ureteroscope: $5-12^{\circ}$

Q: what are the specifications of PCNL stone grasping forceps?

A:

- Length: **36 cm**
- Size: **6,9,12 Fch**
- Handle: 'U' handle with spring
- Tip: 2 prong / 3 prong/ flat jaw/ toothed.

Stone grasping forceps for PCNL



Q: how does the lithoclast hammer come back to its neutral position to strike again?

A: with the help of a rubber bushing

Rubber bushing recoil the hammer back

Initial probe handles were having the spring ,recent versions have rubber bushing

Q: what is the frequency of propeller?

A: 12 cycle/sec

Q: How is lithoclast activated?

A: foot pedal.

Q: What are the specifications of pneumatic lithoclast?

A: compressed air supply 5-6 Bar



Blast Power - 3-4 Bar

- Hand piece - 350 gm
- Probe – 0.8mm, 1.0 mm, 1.5mm, and 2.0 mm
- Length - 42 to 62 cm.

Q: what is electrokinetic lithotripter?

A:

- Consists of a rheostat & a handset contains electric coil that generates electro magnetic field that vibrates the probe.
- Hand piece of Electrokinetic lithotripter is heavier than pneumatic.

Q: what is the length of ureteroscope & Lithoclast probe?

A:

- 62 cm – Lithoclast probe for URS
- 42 cm – Lithoclast probe for nephroscope

Q: who invented ultrasonic lithotripsy?

A: Mulvaney.

Q: What are the components of ultrasonic lithoclast system?

A: Electric Rheostat → produces current & excites piezo crystals

- Piezoceramic plate → produces ultrasonic wave @ 25000 Hz
- Hollow steel probe → transfer the USG energy from piezocrystals to stone.

Q: How does the stone break?

A: The probe causes the stone to resonate @ high frequency & Break

Q: What is the speed of irrigation?

A: 30 ml/ min

Q: what is the Sn pressure required for Ultrasound lithotripsy

A: 60-80 cm H₂O

Q: what are the probe sizes?

A: 2.5 to Fch (0.8mm-4mm)

Q: what are the machine settings for Holmium URS?

A:

	Pulse energy	Frequency	Fibre
Start with	0.8 J	8 Hz	365 µm
Increase to	1.0 J	10 Hz	365 µm
For highly resistant Stone	1.5 J	15 Hz	365 µm

Q: How will you break the stone with laser?

A: Pin it down against ureteric wall and touch the laser to the stone & BANG.

One has to paint the stone with laser.

Q: what are the recent advances in lasers?

A: Er: YAG – Erbium YAG fragments calculi through Photo thermal mechanism

- Wavelength of 2940 nm
- absorbs water efficiently than Holmium.

Q: what is FREDDY?

A:

- Frequency Doubled Double pulse YAG
- Basically ND; YAG laser with doubled /two working frequencies 532 & 1064.
- Efficiently breaks stones.

❖ **STONE BASKETS**

Q: what is Nitinol?

A:

- NITINOL derived from the composition and place of its discovery :

NICKEL **T**itanium Naval **O**rdinance **L**aboratory

- A metal alloy of nickel and titanium, and both elements are present in equal atomic percentages
- Material of choice for applications requiring enormous amount of flexibility and motion, and is the most superior shape memory metal available

Q: what are the components of stone baskets?

A:

Tip:

- Far most distal end
- Helps in introduction into side channel of uretero scope
- **Leading cause of perforation**
- Makes use difficult in calyces
- **Tipless baskets** are now available

Basket proper

- Made up of four or more wires
- Helical basket, non helical basket

Shaft

- Long wired attachment between basket & handle

Sheath

- Covers the shaft (sheath type- detachable)

Handle

- For opening & closing of basket detachable from shaft.
- Handle type-detachable

Q: what is 'basket' made up of?

A: stainless steel (old version)

Nitinol (new)

- **Stainless steel:**
 - Better ureteral distention
 - Less flexible
- **Nitinol**
 - Less ureteric distension
 - More flexible
 - Less caliber so better irrigation

- Better visualization
- Decreases the 'flexi-ureter' deflection by 10⁰

Q: what are the sizes of Basket system?

A:

Width max at open basket = 2cm

Length: 90 cm – 120 cm

Shaft size; 2.2 – 3.2 Fch

Q: what is “Bare-naked Basket”?

A:

- When baskets are used without the sheath covering shaft
- Improves irrigation, vision & Bending.

Q: what are the chief basket designs?

A:

Non- Helical (Segura) (flat Baskets)

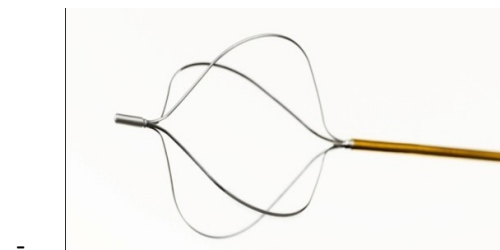
Helical Basket

- Expands ureter firmly
- Multiple stone retrieval
- Best for small stones

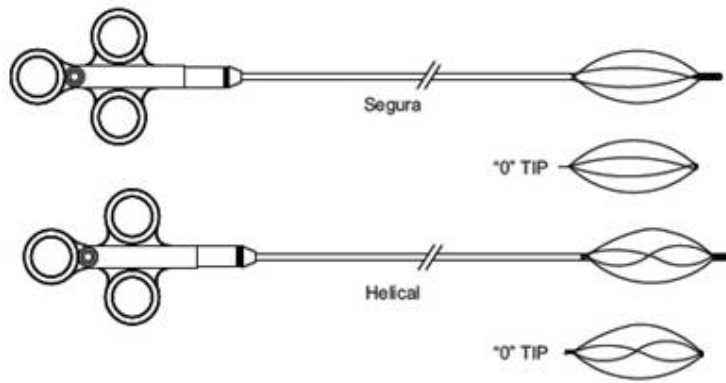


Segura baskets

- Less firm expansion
- Best for large stone



STONE BASKET STAINLESS STEEL



Q: what are the designs according to basket tips?

A: with tip – 1-2 cm

Tip – ‘N’ circle Baskets

Tip-Baskets → Usually stainless steel

→ For lower/mid ureteric stoned

→ Tip acts as 2nd/safety guide wire

Tipless Baskets; – ‘N’ circle Baskets

-for calyceal stones

Filliform tip – 5cm tip



Q: what is a laser basket?

A: contains central hollow shaft, so that a laser fibre 200µ can pass through & Break a stone.

Q: what else can be the use of Segura basket?

A: Biopsy of upper tract tumour

Q: What are the typical advantages of tipless baskets?

A: - “spring” action of basket wire leads to easy dis-entanglement of stone if struck.

- Nitinol wire causes easy maneuverability.

Q: How will you cut entrapped Basket?

A: Holmium laser

- Dismantle the basket handle and remove scope; re-introduce the ureterscope along side the basket shaft and cut the basket.
- Convert to open if needed.



NGAGE basket: for RIRS

- It can engage, reposition and release stone into other calyx as per need in flexible scopy.
- 1.7 to 2.2 fr dimension.

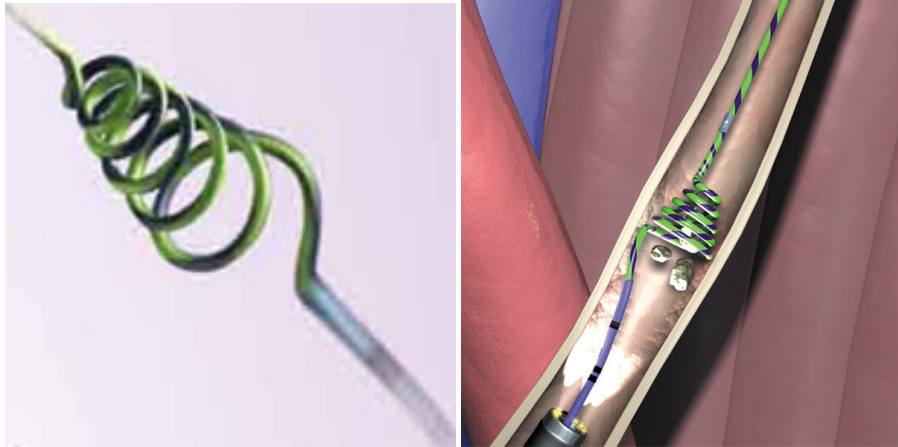
Q: What is stone cone?

A: Modified Nitinol guidewire

With coiled 'memory'

Pass the tip of (ureteroscope/RGC) beyond stone and deploy the stone cone

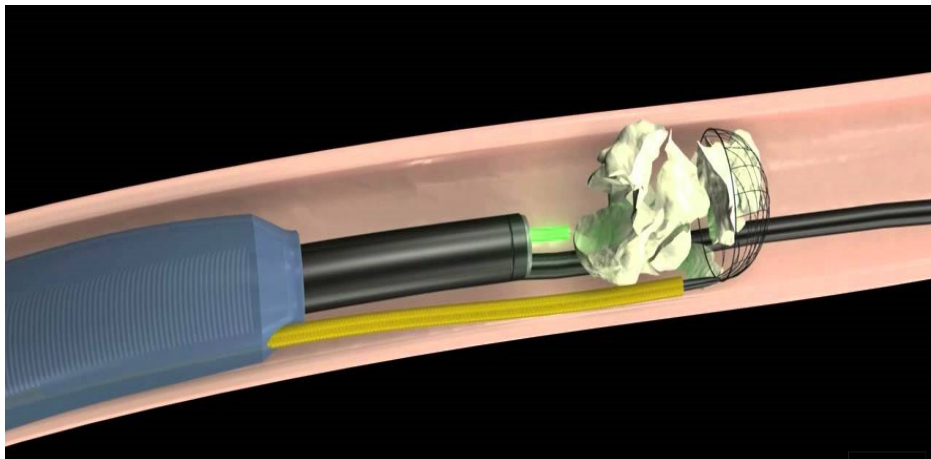
On release the wire coils in concentric ring loops diameter 7mm or 9mm prevents proximal migration of stone / fragments.



Q: what are the other ways of preventing stone proximal migration?

A:

1. N-Trap – tightly woven Nitinol mesh net umbrella like
2. Accordion – nylon & stainless steel guidewire with polyurethane film-forms the bottle brush
3. Lignocaine jelly
4. Urogel



N-Trap Nitinol mesh

Q: How does Urogel function?

A:

- Urogel is solid at body temp & liquid at cold temp.
- Injected through RGC Catheter and solidifies proximal to stone
- After URSL; irrigate with cold saline and dissolve it.

❖ STENTS

Q: who introduced DJ stent?

A: Finney 1978.

Q: what are the materials used for stents

A:

- Polyurethane
- Silicone
- hybrid - C-Flex , Silitek, Percuflex , Tecoflex
- metallic SJ stents

Q: what are the standard specifications of stents?

A:

Size	Length	G/W
3,3.5 Fch	16-26 cm	0.018"
4,4.5 Fch	16-26 cm	0.025"
5,5.5	16-26 cm	0.035"
6, 6.5 , 7.0 fch	16-26 cm	0.038"

Q: what are types of stents according to “ends”?

A: Open ended

Closed ended

Q: What is the most common stent used?

A: 5/24, 5/26

Q: what are long stents?

A: 28 cm, 30 cm, 32 cm stents

For tall persons

For tortuous ureters.

Length of DJ stent is decided from the both j ends.

❖ **How to measure length for optimum DJ for a patient?**

For pediatric patient: age +10

For adult patient: aprox for 150 to 175 cm length of patient 22-26cm length DJ

Measure on x ray from xiphi to pubis distance.

Measure on IVP distance from PUJ to VUJ.

Q: what are the markings on the stent?

A: 0,5,10,15,20,25 cm.

On every 5cm length of a DJ stent there are two holes for drainage. More lumens can decrease the reflux but it can increase the brittleness of a stent.

Only 33% of urine is drained within the lumen of stent rest is drained outside of stent.

❖ **Ideal stent:**

1. Easy to insert

2. Biological inert

3. **Good drainage**
4. **Resistant to encrustation**
5. **High tensile strength**
6. **Low friction ratio**
7. **Self retaining mechanism**

Q: How do we make stent radio-opaque?

A: By in co-operation of radio-opaque salts Barium/Bismuth.

Q: what are the indn of stenting?

A:

- Anastomosis healing
- Stricture healing
- Passive dilation of ureter
- Stone management
- Post PCNL
- Obstructive uropathy – malignancy, -Stone, - TB, - Stricture, radiation.

Q: What are the complications of stenting?

A:

1. Stent removal (a separate procedure)
2. Forgotten stent
3. Stent encrustation
4. Biofilm & infn
5. Stent slipping / migration
6. **Stent related symptoms**
 - Irritation of trigon and smooth muscle spasm are the most important cause.**
 - a) **Flank pain: due to reflux of urine back**
 - b) **Dysuria: irritation of trigone**
 - c) **Frequency and urgency: mechanical stimulation of coil. Stent position is important. Stent must not cross midline.**
 - d) **Local bladder irritation and hematuria**
 - e) **Suprapubic pain**
7. Urinary Reflux
8. Urothelial reaction.

Q: How can you prevent stent related LUTS?

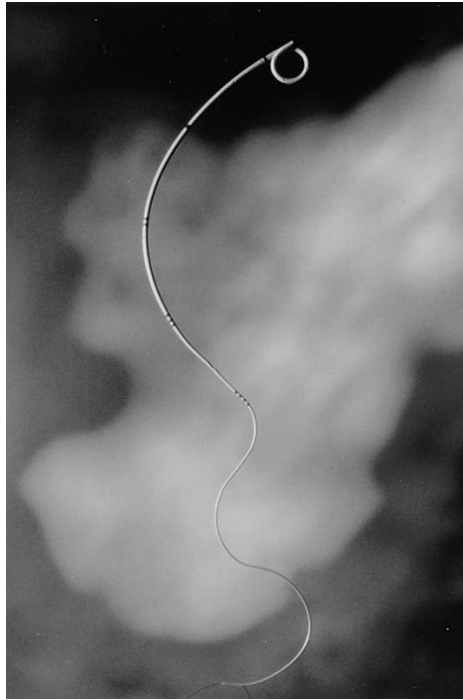
A:

- Tail stent
- Single J stent
- Tamsulosin
- Proper positioning of distal loop

Q: What is a tail stent?

A: It does not have a bladder coil, instead has a long tail in bladder Tail stent - to reduce stent irritation.

- The proximal 7F stent tapers to a lumenless 3F distal tail.
- Its soft distal segment without a coil is thought to improve irritative voiding symptoms.
- It may also prevent stent-related flank pain, because reflux is less likely to occur with this stent in place.



- ❖ **Grooved stent:** better extra luminal flow
- ❖ **Spira stent:** helicated ridges to improve flow
- ❖ **Magnate tip:** having magnate at distal end so no need to remove stent with scopy
- ❖ **Open pass catheter:** rapidly expanding basket to trap fragments of stones post eswl.

Q: what is dual durometer stent?

A: firm Biomaterial, firm loop at kidney end
Soft biomaterial, fine loop at Bladder end.

Q: what is Biofilm?

A: **Structural community of bacteria in self produced matrix and adherent to inert surface.**

Inner most layer: functioning as linking layer

Base film

Surface film shredding of organism

- Surface coating formed due to proteins and other substances due to microbes.
- Makes microbe friendly environment
- Early colony, mid colony, late Biofilm colony
- Ca^{++} , Mg^{++} also get embedded in it forming encrustations.

Q: what is the best drug for Biofilm penetration?

A: Oral fluoroquinolones.

Bio films are resistant to antibiotics due to:

- a) Quorum sensing
- b) Polymicrobial biofilm
- c) Persister cells
- d) Accumulation of waste product due to biofilm.

Q: what is Bio absorbable stent?

A: Absorbs of Its own with time → 2-6 weeks
Made up of PLGA, Poly lactide Glycolic Acid

Q: what stent is best for difficult /malignant stricture?

A: metal mesh stents, metallic stents

Q: What is the composition of metal stent?

A: nickel/Titanium super alloy

Q: what materials can be used for coating on stents?

A: Aim of coating over stent:

- a) **Decreased bio film production**
 - b) **Decrease encrustation**
 - c) **Decrease DJ stent related symptoms**
-
- **Hydrogel** → decreases friction components
 - **Heparin** → Prevents – Biofilm and encrustations both
 - **PTFE coated metal stents**
 - **Antibiotic coated stents (Triclosan)→ broad spectrum antibiotic**
 - **Ketorolac coated stents**
 - **Sirolimus coated stents**
 - **Titanium coating** → most Biological inert.
 - **Diamond like coating:** decrease friction
 - **Sustained release chlorhexidine coating:** decreased bio film

Q: what are the peculiarities of i) C flex , ii) Silitek iii) Percuflex hybrid stents?

A:

C-flex

- Low surface friction
- Hydrophilic coat
- High bio compatibility
- Moderate strength

Silitek

- High strength
- Poor ID/OD ratio → poor drainage

Percuflex

- Maximum ID/OD ratio – good drainage
- Most versatile stent

Polyurethra

- Strength –good
- Versatility- good
- poor biocompatibility
- Low cost
- Good coil strength

Silicone

- Highly biocompatible
- Poor strength
- Susceptible to external compression
- Poor coil retention.

❖ **Metallic stents:**

- a) **Self expanding wallstent**
- b) **Resonance**
- c) **Memoketh**
- d) **Uventa – nitilon stent with PTFE coat**
- e) **Allium stent**

Q: who are the fore-runner manufacturers of S.R URS?

A:, KARL- storz, wolf, Olympus ,ACMI



Q: What are the components of SR-URS?

A:

1. TIP – Beveled / Beaked / Flat
2. Shaft – Gradual tapering / stepwise tapering
 - step less (wolf, Olympus) gradual smooth tapering
 - Presently all are stepless.
3. Eye piece – straight /angled/offset
4. Working channels – one/two
5. Integrated Light Pillar.

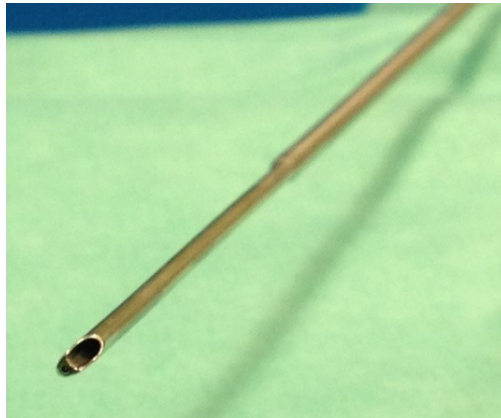
Q: what are the sizes of SR-URS?

A:

- 4 fch –slender ureterscope
- 6- 7.5 fch-regular URS -- 6 fch is the tip and 7.5 fch is the base of shaft
- 8- 9.8 fch –large URS -- 8 fch is the tip and 9.8 fch is the base of shaft
- This tapering/ widening of the shaft diameter may be step wise or as gradual smoothened one
- Most scopes presently are gradual smoothened ones.

Q: How is the tip of SR-URS?

A: usually beaked tip- small rounded beak at 12 o'clock
Recently beveled tip.



Q: Describe the optical system of URS?

A:

Initially: - Rod lens system

Presently: - fibre optic system

- Fibre optic bundles are created from molten glass that has been pulled into small dimension fibres. Each individual glass fibre is clad with second layer of glass of different refractory index. This cladding improves the internal reflection, light transmission and durability.
- They are arranged in coherence fashion.
- When fibres are group randomly they provide excellent light transmission and when in coherent good vision.

Rod lens

- Excellent vision
- Angulation of eyepiece not feasible
- If angled leads to crescentric dark area

Fibre optic

- Leads to 'graining' effect
- Feasible
- No dark areas
- Half moon effect eliminated
- Less traumatic

Q: what is the adv of offset lens / angled lens?

A: Straight path available for lithoclast

Otherwise lithoclast probe has to bend. With the increasing use of laser now decrease demand of off set eye piece.



Q: what is the angle of view?

A: $5-12^{\circ}$

- ACMI- 5°
- Olympus - 7°
- Karl storz - 8°
- Wolf – 12°
- **This angle of vision to visualise instruments and avoid injury during manipulations.**

Q: what are the working channels sizes?

A:

- Karl storz: Usually single channel = 5.5 Fch
- **Wolf \rightarrow channel = 1 x 5, or 2 x 3 F**
- Olympus \rightarrow single channel 1 x 4.2 Fch, or double channel = 2.4 + 3.4 Fch

In general range = 2.2 – 6.6 Fch

One channel of atleast 3.4 Fch , 2nd usually 2.4 Fch.

Q: what is the length of SR-URS?

A: **43 cm**

Short length URS: for female and pediatric populations – **33cm**

Q: How will you sterile SR-URS?

A: Autoclave

Q: What are the advantages of two working channels?

A: Larger one for rigid instrumentation

Smaller one for irrigation

Vision }
Irrigation } is maintained

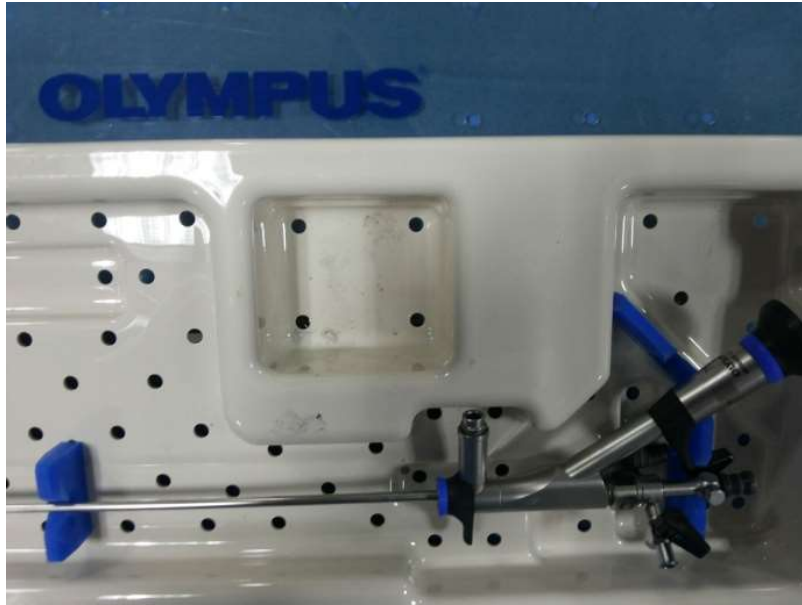
Wolf URS:

1. **4.5/6 FR – 3FR SINGLE CHANNEL**
2. **6/7.5 FR – 1 4FR OR 2 2.4FR**
3. **6.5/8.5FR**
4. **8/9.5FR 1 5FR**

❖ **Concetrina Effect:** During URSL when scope passed through VUJ into proximal ureter leads to cramping of ureter.



- ❖ Rail roading: put a guide wire and pass ureteric scope along with it.
- ❖ Tram tract: put guide wire and pass ureteroscope over another guide wire.



❖ FLEXI-URETEROSCOPE



Q: What are the indn of RIRS/flexi URS

A:

- Management of nephrolithiasis-small stones
- Evaluation & Mx of Lateralizing hematuria
- Urine Cytology
- Biopsy
- Fulguration
- Surveillance/ Fl/up of upper Tract TCC.
- Evaluation of ureteric obstrn., stricture

Q: what are the major manufactures of flexi URS

A: ACMI, Olympus, Wolf, Karl-storz.

Q: what are the measurements of flexi – ureteroscope?

A:

- Tip → 6 – 8 FCH (variable as per manufacture)
- Shaft → 8-10 Fch (variable as per manufacture)
- Access sheath → 10 -12 FCH
- Working channel → 3.6 Fch (standard for all)
- Working length → 65-70 cm std [= length of RGC]
- Field of view → 80-90°

Q: describe the fibre optics of flexi-URS?

A:

- 2-3 fibre optic bundles
- 1-2 may be used for illumination
- One for image transportation.
- **Light is transmitted by non coherence fibre optic and image by coherence fibre optics.**
- Haphazardly arranged (non Coherent)
- End to end arranged (coherent arranged)

Q: what is active deflection & passive deflection?

A:

Active deflection refers to the deflection of the tip of the endoscope,

- Actively controlled by endoscopist by the **movement of liver.**

Active secondary deflection –

- Only in ACMI DUR-8 scope
- ACMI company is now closed.
- (ACMI company was taken over by Gyrus, and Gyrus taken over by Olympus)
- Movement of the flexible Segment several centimeters proximal to tip.
- After fixing liver complete angulation of 300 degree can be achieved.
- Secondary active deflection with second liver.

Newer scopes have two segment of active deflection

Active deflection is usually 180° up to down only (same plane)

- Passive deflection is usually 130° down only.
- Karl storz has 270 active deflections in either direction.

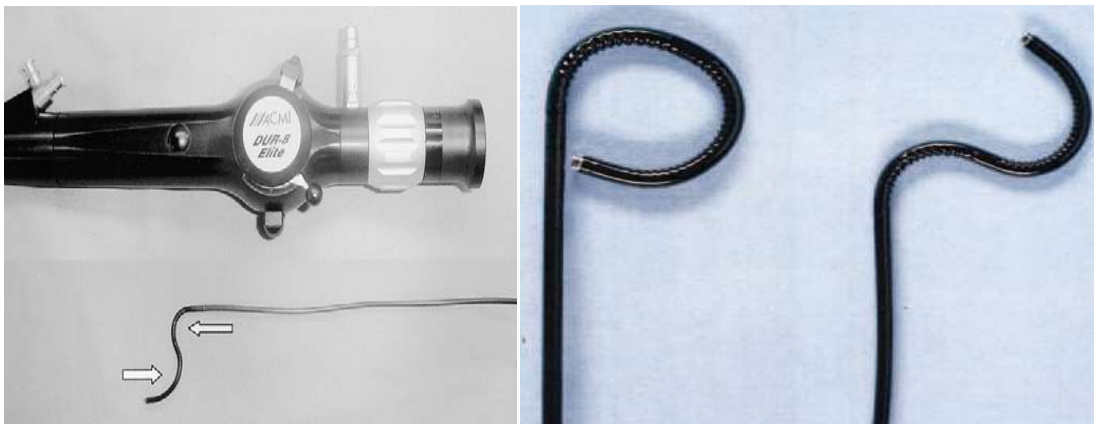
Passive deflection:

- Tip of flexible ureteroscope bends against wall of pelvis to enter into calyx is known as secondary deflection.
- Most of the scope have weaken sheath distally.
- Passive deflection is more usefull in non dilated system.
- In hydronephrotic kidney not present as pelvis is dilated.

Exagerrated deflection:

- Seen in newer scope. FLEX x model.
- Modification in deflecting michenism provides 300 degree of primary deflection.

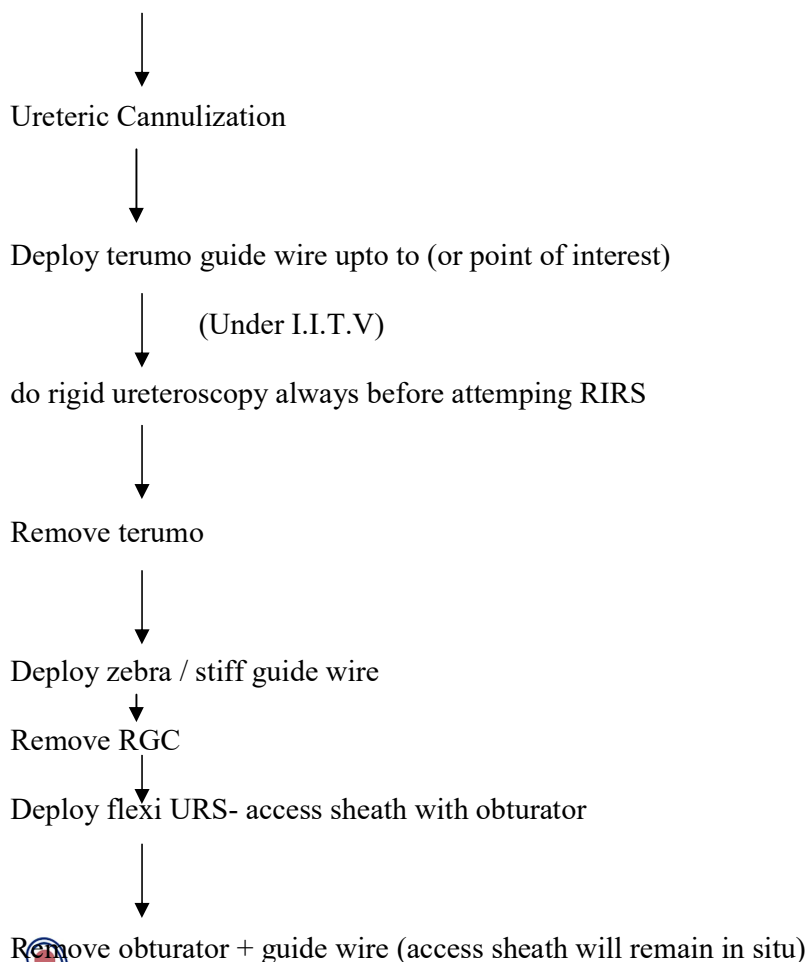
- Plane of deflection is design by reticle seen as notch on screen.



- **Logic, intuitive, American or positive mechanism: up for up and down for down.**
 - **Antilogic, european, nonintuitive, non positive: up for down.**
- ❖ **Deflection mechanism is an integral part of scope. Deflecting mechanism consist of control wire running from from liver to movable metal ring through length of ureterscope. Moving the liver up and down moves the scope by metal ring through wire.**

Q: How will you deploy ureteric access sheath?

A: Cystoscope





Q: Describe the handle of Flex-X2?

A:

- Distal tip of handle is merged with shaft
- There is a **common side channel which receives accessory in the straight limb and water inflow in the perpendicular arm**
- Single lever for deflecting shaft in up and down motions only in a single plane
- **Light cable attachment on the rounded part of the body**
- Pressure channel with cap just next to light port
- Eye piece lens with mountable camera type



Q: when will you put the cap on pressure channel and when not?

A: put the cap on pressure channel when doing

- **Gas sterilization**
- **Shipping**
- **aviation**

Remove cap before

- **Immersing in liquid sterilizers**
- **Cleaning process**

	Flex X 2 specifications	
Working Length	67 cm	
Diameter at tip	7.5 fch	
Shaft size	7.5 fch	
Direction of view	0°	
field of view	88°	
Control lever	Single	
Torque	1:1 torque	
Deflection	270° up	270° down
Max Deflection with laser	270° up /down with 200 µ laser	250° up/down with 365 µ laser
Deflection type	Positive deflection	Counter positive also available
Working channel diameter	3.6 fch	
Grasping forceps	3 fch length 100 cm	With double action jaws
Biopsy forceps	3 fch length 100 cm	With double action jaws
Caultry electrode	3 fch length 110 cm	unipolar



Q: what are the parts of access sheath?

A:

1. Obturator with distal tapered edge
2. Sheath proper (Hydrophilic coated)
3. Proximal funnel.

Obturator has a

1. Luer lock mechanism at proximal end for accepting syringe for doing RGP
 2. proximal ratcheted lock for sheath's funnel
- Tip of sheath has circular radio opaque markers. Also having hydrophilic coating to prevent friction.

Q: what are the sizes of access sheath?

A:

- 9-18 Fch outer diameter sheath
- 20-55 cm length
- Most commonly used assess sheath of 12/14 Fch or 10/12 Fch access sheath.

Q: What are the complications of using access sheath?

A:

- **Buckling of sheath in bladder during insertion**
- **Kinking after removal of obturator.**
- **Ureteral ischemic stenosis, ischemia, necrosis**
- **Ureteric injury and perforation.**
- **Need to place ureteric DJ stent if access sheath is used.**

Q: Is it necessary to deploy DJ stent if ureteric assess sheath is used?

A: yes, (Rapoport et al)

Q: what are the advantages of ureteric access sheath?

A:

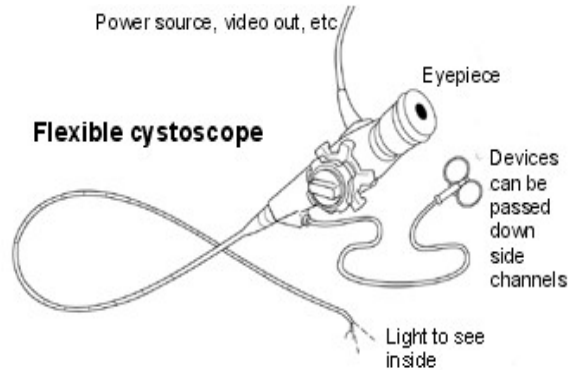
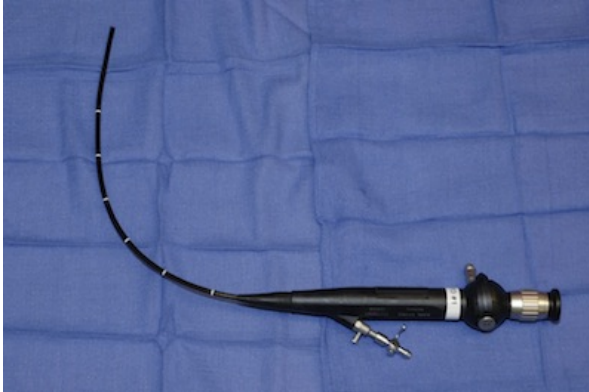
- Hydrophilic coated sheath tapered dilator glides easily through the urethra into the ureteral orifice to establish a conduit for atraumatic passage of endoscopes and retrieval devices.
- 24 cm, 38 cm and 54 cm to accommodate access to the entire ureter -- intramural, distal, mid and proximal
- Facilitates rapid, repeated, and atraumatic access to the upper tracts
- Avoids back-loading over a superstiff guidewire, which may incur costly damage to the ureteroscope.
- Reduces overall costs and decreases operative times.
- Optimizes irrigant flow to improve the surgeon's endoscopic vision while minimizing the intrarenal pressures that the kidney must tolerate.
- Facilitate multiple passage in ureter.
- Minimised morbidity.
- Decrease intra pelvic pressure and decrease infection rate.
- Prevent bickling of scope

❖ FLEXIBLE CYSTOSCOPE

Q: describe the specifications of flexi cystoscope?

A:

- **Length = 37cm**
- **Distal tip: 11-13 Fch**
- **Shaft: 15-17 Fch**
- **Moving channel: 3 Fch**
- **Angulation: 220⁰ up, 110⁰ -down.**



Q: what is endosheath disposable system?

A:

- It is **high quality plastic sheath** used to cover the shaft
- **Avoids cross contamination.**
- Impervious to microbes & virus
- Eliminates long interval of sterilization b/w subsequent scopies.



Q: what are the indications of flexi-cystoscopy?

A: Diagnostic

- Office cystoscopy for Ca-Bladder
- Evaluation of LUTS
- Hematuria
- Evaluation of Urological fistulas
- Retrieval of samples – cytological
- FI/up of Ca-Bldr, Ca-Urethera.
- FI/up after ileal conduit, Neobladder.

❖ **Therapeutics**

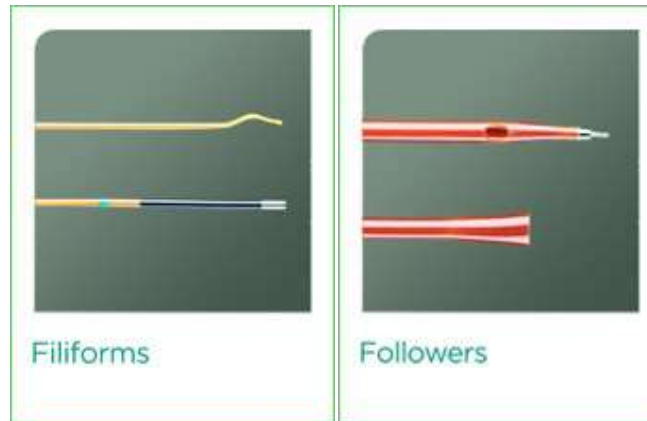
- Biopsy
- Fulguration
- Mx of urethral stricture
- Mx of Bladder Stones



❖ Filliform & Followers

Q: What are filiforms?

A: These are straight, malleable, flexible wires that are used to negotiate the stricture. They are female components with a socket at rear-end for attachment of the followers



Q: what is the full name of filiform?

A: Heyman filiform
Heyman followers

Q: what are the types of tips available for filiform?

A: spiral tip }
Olive tip } sizes 4 Fch, 6 Fch

Q: what are the sizes of followers?

A: length 18"
Size: 8-24 Fch

Q: How will you confirm that a follower has reached the bladder?

A: Urine comes out of followers
Follower has a side hole at its tip.
Once follower is pushed behind the filiform the filiform being soft coiled in the bladder.

Q: what is multiple filliform Hit & try method, for urethral stricture, known as?

A: Fagots method
In fagots method the urethra is filled with as many as filliform bougies hoping that atleast one of them will go across the stricture .the filliform which crosses is retained and rest other removed .urethra is then dilated using filliform followers.



❖ INSTRUMENT STERILIZATION

Q: what are the methods of sterilization you know?

A:

Thermal (physical) – Moist heat under pressure (autoclave), - dry heat

Chemical

- E.T.O
- formaldehyde
- Glutaldehyde
- Hypochlorous acid
- H_2O_2 —sterrad sterilization

Radiation

- Micro wave (non- ionizing)
- X-ray (ionizing)

Q: what is the difference b/w disinfection & sterilization?

A: **Disinfection** → removal of pathogenic infective organism

Sterilization: Removal of all organism – Harmful, Benign, Commensals and removal of spores also.

Q: What is Cidex?

A: Buffered Glutaldehyde soln. 2%, 2.5%, 3.0%, 3.5%

Type: activated Buffered alkaline Glutaldehyde

MOA: Denaturation of Proteins

Cidex: Active ingredient: 2% Glutaldehyde. The manufacturer's instructions indicate that a minimum of 10 hours is required for sterilization.

Cidex is a common designation for a variety of solutions used for antimicrobial or disinfection purposes:

- *Cidex OPA*, a trade name for a solution with phthalaldehyde as active ingredient
- *Nu-Cidex*, with peracetic acid
- *Cidex Plus*, with glutaraldehyde



Q: How is Cidex activated?

A: By adding a activation powered buffer to the liquid.

Q: what is the time required for sterilization

A: Sterilization: - 10 hrs

High level disinfectant; - 25-30 min

Completely immersed with no air bubbles

Q: what are the steps of Cidex disinfn?

A:

1st step – cleaning

2nd step: immersion (20 min minimum)

3rd – cleansing (with water /NS)

4th – Drying

Q: How will you keep a check on cidex soln?

A: chemical dip sticks indicators

- Less than 1.55 concⁿ means discard it.

Q: what is the time duration of Cidex expiry?

A: Max 28 days after activation (manufacture dependent)

Cidex comes in two formulations, Cidex and Cidex-7 (long-life). The shelf life of activated Cidex is 15 days and of activated Cidex-7 is 28 days.

Q: what is CIDEX OPA?

A: Since its introduction in 1999, thousands of healthcare facilities around the world have been using CIDEX[®] OPA Solution every day to safely high-level disinfect flexible endoscopes and other medical devices.

- *Cidex OPA*, a trade name for a solution with phthalaldehyde as active ingredient
- **Effective** – achieves high-level disinfection in 5 minutes at 20°C.
- **Fast-acting** – fast turnaround of reprocessed instruments.
- **Long-lasting efficacy** – reusable for up to 14 days when monitored with CIDEX[®] OPA Test Strips.
- **Easy-to-use** – solution with low odor – requires no activation or mixing.
- **Safe to use for healthcare professionals** – low vapor pressure for minimal inhalation exposure risk, ready-to-use solution reduces handling.
- CIDEX[®] OPA Solution provides a broad-spectrum activity against bacteria, mycobacteria, viruses and fungi.
- CIDEX[®] OPA Solution offers excellent materials compatibility and can therefore be used to disinfect a wide range of medical instruments made of aluminum, brass, copper, stainless steel, plastics, elastomers and dental materials.

Q: what is E.T.O [Et.O]?

A: Ethylene Oxide Sterilization.

M.O.A of E.T.O → Chemical alkylation agent that kills micro organisms including spores by inferring with protein processes leading to death

Q: what are the parameters of ETO?

A: Temp = 60⁰ c – for plastics, 120⁰ c for glass & metals

Moisture = 50% moisture

ETO conc → > 90% E.O

Timing → minimum 2 hrs in pressure chamber.

Q: describe ETO sterilization?

A: Ethylene Oxide (EtO) is a common gas used for low temperature sterilization. It is a colorless, poisonous gas that attacks the cellular proteins and nucleic acids of microorganisms. It is most commonly used to sterilize instruments with long lumens such as endoscopes and all materials that have to be sterilized but cannot withstand higher temperature. EtO process temperatures from 25 - 55°C are used. A lower temperature results in a less efficient process which leads to a longer exposure time.

EtO Sterilization Cycle

There are at least three stages in a typical EtO sterilization cycle:

- Preconditioning
- Sterilization
- Aeration (Degassing)

Cycle time is usually more than 14 hours.

Preconditioning

Preconditioning prepares the chamber environment to meet the ideal conditions for temperature, pressure and humidity. First air is removed from the chamber to allow for gas penetration. A leakage test is performed, to ensure that staff and environment are safe. Next, some steam is injected into the chamber and humidifies the load, since EtO is only effective in a humid environment. The chamber is heated by either steam or hot water which is present in the jacket. Normally the jacket is kept at the same temperature 24/7 to minimize temperature fluctuations.

Sterilization

The second stage is the actual sterilization process. The EtO enters the chamber via evaporation with a certain amount of steam to keep the humidity level up as well as to make sure the EtO is reaching all parts of the load. When the required concentration in the chamber and load is achieved the actual sterilization stage starts. The lower the gas concentration in the chamber the longer is the sterilization time. As EtO is absorbed by many kinds of plastic materials it is important to keep the concentration at the right level. To achieve this EtO is sometimes added to the chamber after a while. It is of major importance to ensure the appropriate concentration level of EtO in the chamber to achieve effective and safe sterilization.

Aeration (Degassing)

Aeration is the most important and longest part of the EtO sterilization cycle. As mentioned, materials such as plastics and rubbers absorb gas and if applied to patients, the toxic gas could damage their body tissue! For this reason it is very important to have an excessive aeration stage to remove any remaining EtO gas and to allow absorbed gas to evaporate again from the sterilized items. This is done by circulating HEPA filtered air over the load at a temperature of 30°C to 50°C. This is sometimes done in the sterilizer's chamber, but sometimes the sterilized items are placed in a special aeration cabinet.

Q: compare advantages & disadvantages of ETO?

A: Advantages of EtO are:

- Low temperature
- High efficiency – destroys microorganisms including resistant spores
- Large sterilizing volume/ chamber capacity
- Non corrosive to: plastic, metal and rubber materials

Disadvantages are:

- Excessively Long cycle
- Safety concerns - carcinogenic to humans
- Toxicity issues - toxic residues on surgical instruments and tubing
- Not recommended for flexible scope
- EtO is flammable
- Requires special room conditions, safety equipment and separate ventilation system
- Relatively high annual costs for maintenance, servicing and consumables

Q: How are telescopes sterilized?

A: Best auto clave

Practically by cidex

CHAPTER

16

Staging / Names

Ca Testis	Walter Reed Staging, Skiner System
RCC	Robson Staging
TCC of bladder	Marshall's Staging
Urachal Carcinoma	Sheldon Staging
Ca Penis	Johnson Staging
Urethral Perforation	Traxer system
Stone Morphometry	Reiswiler For Staghorn
Complication of Surgery	Klavien Dindo
Ca Penis HPE	Cubilla Classification
VUR Grading	Labowitz
Cong. Curvature of Penis	Devine & Harton
DESD	Blavais
Emphysematous Pyelonephritis	Haung, Wang
Extra Adrenal PCC	Glenner
IVC Thrombus	Nevus Zinka & Ciancia
Pelvic #	Tile's, Young Bagrass
PFUDD	Goldman Modification of Macculum & Calapinto
Ant. Urethral Trauma	Macanich
Calyx diverticulum	Dratler classification



CHAPTER

17

First in Urology

Adrenalactomy	Thornton
Adrenalactomy for PCC	Mayo
Laparoscopic Adrenalactomy	Gagner
Retro Laparoscopic Adrenalactomy	Meccan
Retro Laparoscopic Adrenalactomy in India	Dr. Bhat
Coin GUTB	Wild Boltz
Hypothesis for GUTB	Mandler
Ileal Conduit Popularized	Bricker
Orthotripic Neo Bladder	Camey
BCG Popularized	Morales
1 st Continent Pouch	Gilchrist
1 st USG of Prostate	Ouchi
IPSS	Berry
Ressectoscope	Stan Macarthy
Spring Action Working Element Ressectoscope	Iglesis
Partial Nephrectomy	Czerny
Renal Scoring System	Roberto Ozzo
ITGCN	Skekeback
Modified RPLND Tempelate	Narayan
Testis Sparing Surgery	Richie
DJ Stent	Zimskind
DJ Insertion	Finney
PCN	Goodwin
PCNL	Fanstorm & Johnson
Miniperk	Ballmen
Tubelless PCNL	Wickman
Acute Dilatation of Tract	Castenada
URS	Lyon
Superperk	Kaushik Shah
Micro Perk	M.R. Desai
Ultra Miniperk	Janak Desai
Anatropic Nephrolithotomy	Boyce
SLNB	Cabana's
VEIL	Tabias Machado
MILND	Catanola
Endopyelotomy	Ramsey
Endopyelotomy Popularized	Badlani
Retrograde Endopyelotomy	Clayman
Under Water Cautey	Edwin Beer
Cutting Loop	Maximiller Stern
Rack & Pillion Resectoscope	Macarthy
STRING	Matersacker
VUR Correction	Hutch
Urethral Catheterization	Raiche Not Foley
Radical Nephrectomy	Robson
Lap. RNF	Clayman

